Group Award Specification for:

HNC Aircraft Engineering at SCQF level 7

Group Award Code: GK79 15

HND Aircraft Engineering at SCQF level 8

Group Award Code: GK7D 16

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Contents

1 Introduction

This document was previously known as the Arrangements document. The purpose of this document is to:

- assist centres to implement, deliver and manage the qualification
- provide a guide for new staff involved in offering the qualification
- inform course managers teaching staff, assessors, learners, employers and HEIs of the aims and purpose of the qualification
- provide details of the range of learners the qualification is suitable for and progression opportunities

This is the Group Award Specification for the HNC Aircraft Engineering and the HND Aircraft Engineering. These qualifications were revised in 2014 and replace the previous HNC Aircraft Engineering (G800 15) and HND Aircraft Engineering (G8GE 16) qualifications respectively.

The revised HND Aircraft Engineering Group Award subsumes the revised HNC Aircraft Engineering Group Award.

This Group Award Specification reflects the Outcome of the first full review of the previous HNC and HND qualifications, validated in 2005 and 2007 respectively. The rationale for the review was to ensure that these two qualifications remain relevant to the modern aircraft engineering industry in supporting the educational progression and career aspirations of learners as well as the requirements of employers. This review encompassed aspects of Group Award structure and content as well as approaches to learning, teaching and assessment.

The broad range of changes to these qualifications to bring about the desired updating of the HNC and HND are as follows:

- The restricted optional groupings of Units in the HNC have been removed as they presented a barrier to the flexibility of the qualifications.
- The new *Engineering Mathematics* Units have been included in the new qualification structures.
- New Units have been introduced to the qualification structures to bring in a higher level of topics in aerodynamics, composite materials, structural mechanics and engineering software applications.
- Existing Units in the broad disciplines of practical skills development, aircraft engineering principles and aircraft engineering systems analysis have been revised to include updated technologies and techniques.
- All other Units were reviewed and revised as necessary to update the approaches to learning, teaching and assessment.

The title, ‘Aircraft Engineering’ remains the most appropriate as it best reflects the practical application of engineering principles and techniques across the aircraft engineering industry sectors. These qualifications provide a balanced mix of aircraft engineering design and maintenance related topics which will best serve learners in the early years (SCQF levels 7 and 8) of their aircraft engineering education. In doing so, these qualifications provide the foundation for progression into different sectors of the industry as well as progression to degree level studies.

The HNC and HND are suitable for a broad range of learners to study full or part time such as high school leavers, students progressing from relevant FE qualifications, people working in the aircraft engineering industry, and adult returners from the UK and beyond.

Possible employment opportunities span a wide spectrum of engineering related careers, initially at trainee or engineering technician level, within the aviation industry. These qualifications are devised to provide the most relevance to the aircraft design/manufacture and operations/maintenance sectors. As such, the Original Equipment Manufacturers, Airline and Maintenance and Repair Organisations business areas are likely to provide the best employment opportunities for learners with either of these qualifications.

Design of the HNC and HND Aircraft Engineering content and level has incorporated topics specifically to provide articulation with advanced standing to degree programmes in aircraft or aeronautical engineering. Such articulation potential has been forged on the basis of a high level of engineering mathematics together with complex analytical solving of aircraft engineering problems as well as a promotion of learner responsibility with the programme pedagogy.

The design of these HNC and HND qualifications are recognised by Semta, the Sector Skills Council for the Science Engineering Manufacturing Technologies sector.

As part of the review of these qualifications, the Qualifications Development Team has identified a number of Units that link to National Occupational Standards (NOS). Full details of this mapping exercise have been provided in Section 5.2 of this Group Award Specification.

The HNC and HND Aircraft Engineering are designed to meet the education requirements for professional recognition for Engineering Technicians, through the UK Engineering Council. Full details of this mapping exercise can be found in Section 5.2.2.

2 Qualifications structure

2.1 Structure - HNC Aircraft Engineering

This HNC Group Award is made up of 12 SQA credits. It comprises 96 SCQF credit points, of which 56 are at SCQF level 7 in the mandatory section, including a Graded Unit of 8 SCQF credit points at SCQF level 7. The remaining 40 SCQF credit points required for the Group Award are to be selected from the optional section. A mapping of Core Skills development opportunities is available in section 5.3 of this Group Award Specification.

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
Mandatory Units					
H7MB	34	Communication: Practical Skills	1	8	7
H7K1	34	Engineering Mathematics 2	1	8	7
H94D	34	Physics for Aviation	1	8	7
H94G	34	Aerodynamics and Flight Mechanics 1	1	8	7
H94F	34	Aircraft Structures and Materials	1	8	7
H94K	34	Aircraft Propulsion Systems: Introduction	1	8	7
H9AV	34	Aircraft Engineering: Graded Unit 1	1	8	7
Optional Units: 5 SQA Unit credits required (40 SCQF credit points)					
H7K0	33	Engineering Mathematics 1	1	8	6
H94A	33	Aircraft Engineering Practical Skills	2	16	6
H94E	34	Aircraft Inspection and Repair	1	8	7
H949	34	Aircraft Electrical and Electronic Principles	2	16	7
H94M	34	Aircraft Engineering Systems	2	16	7
H94V	34	Aircraft Avionics Principles	1	8	7
H94H	34	Aircraft Hydraulic and Pneumatic Systems	1	8	7
H94J	34	Human Factors for Aircraft Engineering	1	8	7
DP5M	34	Aircraft Instruments	1	8	7
DR1X	34	Computer Aided Draughting for Engineers	1	8	7
DR1T	34	Statics and Strength of Materials	1	8	7
DT9P	34	Thermofluids	1	8	7
D75X	34	Information Technology: Applications Software 1	1	8	7
H7K2	34	Engineering Mathematics 3	1	8	7
H7K3	35	Engineering Mathematics 4	1	8	8
DT5T	35	Heat Transfer and Fluid Mechanics	1	8	8

The competency level of the HNC is reflected in the mandatory Units which represent the prime building Units.

Aircraft Engineering: Graded Unit 1 provides qualification grading through examination assessments across the mandatory Units with the exception of *Communication: Practical Skills*.

2.2 Structure - HND Aircraft Engineering

This HND Group Award is made up of 30 SQA credits comprising 240 SCQF credit points, of which at least 8 SQA credits must be at SCQF level 8. The mandatory core comprises 72 credit points at SCQF level 7, one Unit at SCQF level 8 and Graded Unit 2 of 16 SCQF credit points at SCQF level 8.

The remaining 144 SCQF credit points (18 SQA credits), with at least 40 SCQF credit points at SCQF level 8, are to be selected from the optional section. A mapping of Core Skills development opportunities is available in Section 5.3 of this Group Award Specification.

4 code	2 code	Unit title	SQA credit	SCQF credit points	SCQF level
Mandatory Units					
H7MB	34	Communication: Practical Skills	1	8	7
H7K1	34	Engineering Mathematics 2	1	8	7
H7K2	34	Engineering Mathematics 3	1	8	7
H94D	34	Physics for Aviation	1	8	7
H94G	34	Aerodynamics and Flight Mechanics 1	1	8	7
H94F	34	Aircraft Structures and Materials	1	8	7
H94K	34	Aircraft Propulsion Systems: Introduction	1	8	7
H94J	34	Human Factors for Aircraft Engineering	1	8	7
H94R	35	Aerodynamics and Flight Mechanics 2	1	8	8
H9AV	34	Aircraft Engineering: Graded Unit 1	1	8	7
H9AW	35	Aircraft Engineering: Graded Unit 2	2	16	8
Optional Units: 18 SQA Unit credits required (144 SCQF credit points) At least 5 SQA Unit credits/40 SCQF credit points at SCQF level 8					
H7K0	33	Engineering Mathematics 1	1	8	6
H94A	33	Aircraft Engineering Practical Skills	2	16	6
H94E	34	Aircraft Inspection and Repair	1	8	7
H949	34	Aircraft Electrical and Electronic Principles	2	16	7
H94M	34	Aircraft Engineering Systems	2	16	7
H94V	34	Aircraft Avionics Principles	1	8	7
H94H	34	Aircraft Hydraulic and Pneumatic Systems	1	8	7
DP5M	34	Aircraft Instruments	1	8	7
DR1X	34	Computer Aided Draughting for Engineers	1	8	7
DR1T	34	Statics and Strength of Materials	1	8	7
DT9P	34	Thermofluids	1	8	7
D75X	34	Information Technology: Applications Software 1	1	8	7
H94P	35	Advanced Composite Materials	1	8	8
H94T	35	Aircraft Avionics and Electrical Systems	2	16	8
H948	35	Engineering Software Applications	1	8	8
H94N	35	Aircraft Gas Turbine Engines	2	16	8
H94L	35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	1	8	8
DV01	35	Strength of Materials: Advanced	1	8	8
H7K3	35	Engineering Mathematics 4	1	8	8
H7K4	35	Engineering Mathematics 5	1	8	8
DT5T	35	Heat Transfer and Fluid Mechanics	1	8	8

The competency level of the HND is reflected in the mandatory Units along with a further 5 SQA credits at SCQF level 8 selected from the optional Units as deemed appropriate to a delivery Centre's learner progression requirements.

Aircraft Engineering: Graded Unit 2 provides qualification grading through an aircraft engineering project devised to develop the learners' ability in the wide range of competences embodied within the HND. These skills include engineering communication, project management, synthesis and analysis of engineering problems, research, investigation and evaluation relevant to the successful completion of the specialist aircraft engineering problem undertaken by the learner.

3 Aims of the qualifications

Principal Aim

HNC Aircraft Engineering

To provide an industry recognised qualification that provides learners with educational and potential career progression while contributing to the capacity and capability building of the aeronautical and aircraft engineering sectors of aviation.

HND Aircraft Engineering

To provide an industry recognised qualification with extended breadth and depth than the HNC which provides learners with further educational and greater potential career progression while contributing to the capacity and capability building of the aeronautical and aircraft engineering sectors of aviation.

3.1 General aims of the qualifications

The general aims of the qualifications are to:

1 Enhance learners' employment prospects.

2 Support learners' career development and Continued Professional Development.

3 Enable progression within the SCQF (Scottish Credit and Qualifications Framework).

4 Provide learners' with a flexible curriculum comprising mandatory and optional Units.

5 Develop Core and transferable skills.

3.2 Specific aims of the qualifications

HNC Aircraft Engineering

6 Provide learners with progression to the HND in Aircraft Engineering.

7 Develop learners knowledge, understanding and practical skills consistent with progression to, and within, careers in aircraft/aeronautical engineering.

8 Develop learners ability to interpret and apply analysis skills to the solution of aircraft/aeronautical engineering related problems.

9 Develop learners ability to effectively use a range of communication skills relevant to the needs of aircraft/aeronautical engineers.

10 Provide learners with the underpinning knowledge to support related National Occupational Standards in Aircraft/Aeronautical Engineering.

11 Provide learners with a qualification that meets the educational requirements that contributes to the attainment of professional registration with the UK Engineering Council as an Engineering Technician.

12 Develop learners knowledge and understanding of the importance of safety in all aspects within an aircraft/aeronautical engineering context.

HND Aircraft Engineering

6 Provide learners with an articulation route to degree level studies in aircraft/aeronautical engineering.

7 Develop learners knowledge, understanding and practical skills consistent with progression to, and within, careers in aircraft/aeronautical engineering.

8 Develop learners ability to interpret and apply analysis skills to the solution of aircraft/aeronautical engineering related problems.

9 Develop learners ability to synthesise and evaluate the solution of aircraft/aeronautical engineering problems.

10 Develop learners skills to investigate and research topics in aircraft/aeronautical engineering.

11 Develop learners knowledge and understanding of the importance of safety in all aspects within an aircraft/aeronautical engineering context including Human Factors.

12 Develop learners ability to effectively use a range of communication skills relevant to the needs of aircraft/aeronautical engineers.

13 Develop learners ability to apply principles of engineering project planning and implementation.

14 Provide learners with the underpinning knowledge to support related National Occupational Standards in aircraft/aeronautical engineering.

15 Provide learners with a qualification that meets the educational requirements that contributes to the attainment of professional registration with the UK Engineering Council as an Engineering Technician.

3.3 Graded Units

There are two mandatory Graded Units within the HND framework worth a total of 3 SQA credits, of which the single credit *Graded Unit 1* is common to the HNC framework. The purpose of the Graded Units is to assess the learner's ability to apply and integrate knowledge and skills gained through prime individual Units within the framework. By this means, learners will be able to demonstrate that they have achieved the aims of the Group Award as detailed in Sections 3.1 and 3.2 of this Group Award Specification. The Graded Units also provide a means of grading a learner's overall achievement of the Group Award.

Aircraft Engineering: Graded Unit 1 (1 SQA credit at SCQF level 7) is assessed by two 1.5 hour examinations covering subject material from the following mandatory Units:

Engineering Mathematics 2
Physics for Aviation
Aerodynamics and Flight Mechanics 1
Aircraft Structures and Materials
Aircraft Propulsion Systems: Introduction

It is recommended that delivery of this Graded Unit is organised to ensure that specialists are available for each of the constituent Units. Formative assessment in preparation for the examinations should be planned throughout Semester 2 prior to the examination date.

Aircraft Engineering: Graded Unit 2 (2 SQA credits at SCQF level 8) takes the form of a project-based assignment which seeks to assess skills in the following areas:

- Extend technical knowledge and skills related to specific aircraft engineering applications.
- Apply complex communication in an engineering context.
- Work effectively as a team member.
- Apply ICT solutions to engineering problems.
- Apply problem solving and planning skills to a complex aircraft engineering application.

The mapping table in Section 5.3 shows how the Graded Units integrate the aims of the qualification.

4 Recommended entry to the qualifications

Entry to the qualifications is at the discretion of the centre. The following information on prior knowledge, skills, experience or qualifications that provides suitable preparation for this qualification has been provided by the Qualification Development Team as guidance only.

Learners would benefit from having attained the skills, knowledge and understanding required through the following or equivalent qualifications and/or experience:

- National 5 English or equivalent (SCQF level 5)
- Plus one of the following:
  - At least one Higher (SCQF level 6) or equivalent in Mathematics, Physics or Engineering Science
  - SQA National Certificate (NC) in an engineering discipline at SCQF level 6
  - SVQ level 3 in Aeronautical Engineering (SCQF level 6)
  - EASA Part 66 Category A for aircraft certifying mechanics (SCQF level 6)

4.1 Core Skills entry profile

The Core Skills entry profile provides a summary of the associated assessment activities that exemplify why a particular level has been recommended for this qualification. This information should be used to identify if additional learning support needs to be put in place for learners whose Core Skills profile is below the recommended entry level or whether learners should be encouraged to do an alternative level or learning programme.

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Communication	5	Learners require good communication skills in written work as part of course assessment as well as good oral communication skills to take part in discussions and make formal presentations.
Numeracy	5	Good numerical skills are essential for learners undertaking these qualifications as they will need to apply a wide range of numerical skills. Learners will need to be able to apply numerical analysis techniques to solve engineering problems.
Information and Communication Technology (ICT)	5	Learners will be required to use a range of applications software (word processing and spreadsheets) in assessment work.

Core Skill	Recommended SCQF entry profile	Associated assessment activities
Problem Solving	5	Good problem solving skills will be required to interpret engineering problems, identify factors of a problem and compose a plan to solve the problem, including identifying resources required.
Working with Others	4	Team work is an essential element in engineering. Desirable co-operative working skills are identifying roles, strengths and weaknesses within a team.

5 Additional benefits of the qualification in meeting employer needs

These qualifications were designed to meet a specific purpose and what follows are details on how that purpose has been met through mapping of the Units to the aims of the qualifications. Through meeting the aims, additional value has been achieved by linking the Unit standards with those defined in National Occupational Standards and/or trade/professional body requirements. In addition, significant opportunities exist for learners to develop the more generic skill, known as Core Skills through doing these qualifications.

5.1 Mapping of qualification aims to Units

5.1.1 HNC Aircraft Engineering

Code	Unit title	Aims											
		1	2	3	4	5	6	7	8	9	10	11	12
H7MB 34	Communication: Practical Skills	√	√	√		√	√	√		√		√	
H7K1 34	Engineering Mathematics 2	√	√	√		√	√	√	√			√	
H94D 34	Physics for Aviation	√	√	√		√	√	√	√			√	
H94G 34	Aerodynamics and Flight Mechanics 1	√	√	√		√	√	√	√			√	
H94F 34	Aircraft Structures and Materials	√	√	√		√	√	√	√		√	√	√
H94K 34	Aircraft Propulsion Systems: Introduction	√	√	√		√	√	√	√			√	√
H9AV 34	Aircraft Engineering: Graded Unit 1	√	√	√			√	√	√			√	
H7K0 33	Engineering Mathematics 1	√	√		√	√	√		√			√	
H94A 33	Aircraft Engineering Practical Skills	√	√		√	√	√	√		√	√	√	√
H94E 34	Aircraft Inspection and Repair	√	√	√	√	√	√	√		√	√	√	√
H949 34	Aircraft Electrical and Electronic Principles	√	√	√	√	√	√	√	√	√	√	√	√
H94M 34	Aircraft Engineering Systems	√	√	√	√	√	√	√	√	√	√	√	√
H94V 34	Aircraft Avionics Principles	√	√	√	√	√	√	√	√	√	√	√	√
H94H 34	Aircraft Hydraulic and Pneumatic Systems	√	√	√	√	√	√	√	√	√		√	√
H94J 34	Human Factors for Aircraft Engineering	√	√	√	√	√	√	√		√		√	√
DP5M 34	Aircraft Instruments	√	√	√	√	√	√	√	√			√	√
DR1X 34	Computer Aided Draughting for Engineers	√	√	√	√	√	√	√		√	√	√	
DR1T 34	Statics and Strength of Materials	√	√	√	√	√	√		√			√	
DT9P 34	Thermofluids	√	√	√	√	√	√		√			√	
D75X 34	Information Technology: Applications Software 1	√	√	√	√	√	√	√		√		√	
H7K2 34	Engineering Mathematics 3	√	√	√	√	√	√		√			√	
H7K3 35	Engineering Mathematics 4	√	√	√	√	√	√		√			√	
DT5T 35	Heat Transfer and Fluid Mechanics	√	√	√	√	√	√		√			√	

5.1.2 HND Aircraft Engineering

Code	Unit title	Aims														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H7MB 34	Communication: Practical Skills	√	√	√		√	√	√					√	√		√
H7K1 34	Engineering Mathematics 2	√	√	√		√	√	√	√							√
H7K2 34	Engineering Mathematics 3	√	√	√	√	√	√		√							√
H93D 34	Physics for Aviation	√	√	√		√	√	√	√							√
H94G 34	Aerodynamics and Flight Mechanics 1	√	√	√		√	√	√	√							√
H94F 34	Aircraft Structures and Materials	√	√	√		√	√	√	√			√			√	√
H94K 34	Aircraft Propulsion Systems: Introduction	√	√	√		√	√	√	√			√			√	√
H94J 34	Human Factors for Aircraft Engineering	√	√	√		√	√	√		√	√	√		√		√
H94R 35	Aerodynamics and Flight Mechanics 2	√	√	√		√	√	√	√	√	√					√
H9AV 34	Aircraft Engineering: Graded Unit 1	√	√	√		√	√	√	√							√
H9AW 35	Aircraft Engineering: Graded Unit 2	√	√	√		√	√	√	√		√		√	√		√
H7K0 33	Engineering Mathematics 1	√	√		√	√			√							√
H94A 33	Aircraft Engineering Practical Skills	√	√		√	√		√				√	√	√	√	√
H94E 34	Aircraft Inspection and Repair	√	√	√	√	√		√				√	√	√	√	√
H949 34	Aircraft Electrical and Electronic Principles	√	√	√	√	√	√	√	√			√	√		√	√
H94M 34	Aircraft Engineering Systems	√	√	√	√	√	√	√	√	√	√	√	√		√	√
H94V 34	Aircraft Avionics Principles	√	√	√	√	√	√	√	√			√	√		√	√
H94H 34	Aircraft Hydraulic and Pneumatic Systems	√	√	√	√	√	√	√	√			√	√			√
DP5M 34	Aircraft Instruments	√	√	√	√	√	√	√	√			√				√
DR1X 34	Computer Aided Draughting for Engineers	√	√	√	√	√	√	√					√	√	√	√
DR1T 34	Statics and Strength of Materials	√	√	√	√	√	√		√							√
DT9P 34	Thermofluids	√	√	√	√	√	√		√							√
D75X 34	Information Technology: Applications Software 1	√	√	√	√	√	√	√					√			√
H94P 35	Advanced Composite Materials	√	√	√	√	√	√	√	√	√	√	√	√		√	√

Code	Unit title	Aims														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H94T 35	Aircraft Avionics and Electrical Systems	√	√	√	√	√	√	√	√	√	√	√	√		√	√
H948 35	Engineering Software Applications	√	√	√	√	√	√	√	√	√	√		√			√
H94N 35	Aircraft Gas Turbine Engines	√	√	√	√	√	√	√	√	√	√	√	√			√
H94L 35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	√	√	√	√	√	√	√	√	√	√	√	√			√
DV01 35	Strength of Materials: Advanced	√	√	√	√	√	√	√	√	√	√	√				√
H7K3 35	Engineering Mathematics 4	√	√	√	√	√	√		√	√	√					√
H7K4 35	Engineering Mathematics 5	√	√	√	√	√	√		√	√	√					√
DT5T 35	Heat Transfer and Fluid Mechanics	√	√	√	√	√	√	√	√	√	√	√				√

5.2 Mapping of National Occupational Standards (NOS) and trade body standards

5.2.1 Mapping of Units to National Occupational Standards (NOS)

Code	Unit Title	National Occupational Standard															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
H94F 34	Aircraft Structures and Materials								√								√
H94A 33	Aircraft Engineering Practical Skills	√	√	√	√	√	√	√			√	√	√				
H94E 34	Aircraft Inspection and Repair					√			√		√		√		√	√	
H949 34	Aircraft Electrical and Electronic Principles							√						√			
H94M 34	Aircraft Engineering Systems						√	√			√				√		
H94V 34	Aircraft Avionics Principles															√	
H94P 35	Advanced Composite Materials																√
H94T 35	Aircraft Avionics and Electrical Systems															√	
DR1X 34	Computer Aided Draughting for Engineers									√	√						

No	NOS Title		No	NOS Title	
1	SEMEA3005:	Marking out composite and/or metallic aircraft components	9	SEMAE3186:	Producing aeronautical engineering drawings/models using 3D computer aided techniques
2	SEMAE3008:	Installing aircraft mechanical fasteners into composite and/or metallic components	10	SEMAE3002:	Using and interpreting engineering drawings and documents
3	SEMAE3007:	Bending and forming aircraft components	11	SEMAER2_06:	Carrying out aircraft routine servicing
4	SEMAE3006:	Cutting and shaping aircraft components	12	SEMAER2_07:	Carrying out maintenance on aircraft mechanical systems by component replacement
5	SEMAE3144:	Removing and replacing components of aircraft control systems	13	SEMAER2_08:	Carrying out maintenance on aircraft electrical/electronic systems by component replacement
6	SEMAER2_15:	Assembling aircraft airframe ancillary components	14	SEMAE3141:	Carrying out fault diagnosis on aircraft airframe mechanical components and systems
7	SEMAER2_17:	Assembling aircraft electrical components	15	SEMAE3120:	Carrying out fault diagnosis on aircraft avionics components or systems
8	SEMAE3013:	Repairing airframes and structures	16	SEMAER2_27:	Carrying out bonding operations on aircraft composite components

5.2.2 Mapping of Units to Educational Components of UK-SPEC Standards for Engineering Technician

Code	Unit title	UK-SPEC Standards for Engineering Technicians				
		A. Use engineering knowledge and understanding to apply technical and practical skills	**B. Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems or services**	**C. Accept and exercise personal responsibility**	**D. Use effective communication and interpersonal skills**	**E. Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment**
H7MB 34	Communication: Practical Skills				√	
H7K1 34	Engineering Mathematics 2	√	√			
H94D 34	Physics for Aviation	√				
H94G 34	Aerodynamics and Flight Mechanics 1	√	√			
H94F 34	Aircraft Structures and Materials	√	√			
H94K 34	Aircraft Propulsion Systems: Introduction	√	√			
H9AV 34	Aircraft Engineering: Graded Unit 1	√				
H94J 34	Human Factors for Aircraft Engineering			√	√	√
H94R 35	Aerodynamics and Flight Mechanics 2	√	√			
H9AW 35	Aircraft Engineering: Graded Unit 2	√	√	√	√	√
H7K0 33	Engineering Mathematics 1	√				
H94A 33	Aircraft Engineering Practical Skills	√	√	√	√	√
H94E 34	Aircraft Inspection and Repair			√	√	√
H949 34	Aircraft Electrical and Electronic Principles	√	√			
H94M 34	Aircraft Engineering Systems	√	√			
H94V 34	Aircraft Avionics Principles	√	√			
H94H 34	Aircraft Hydraulic and Pneumatic Systems	√	√			
DP5M 34	Aircraft Instruments	√	√			

Code	Unit title	UK-SPEC Standards for Engineering Technicians				
		A. Use engineering knowledge and understanding to apply technical and practical skills	**B. Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems or services**	**C. Accept and exercise personal responsibility**	**D. Use effective communication and interpersonal skills**	**E. Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment**
DR1X 34	Computer Aided Draughting for Engineers	√	√			
DR1T 34	Statics and Strength of Materials	√	√			
DT9P 34	Thermofluids	√	√			
D75X 34	Information Technology: Applications Software 1	√	√			
H94P 35	Advanced Composite Materials	√	√			
H94T 35	Aircraft Avionics and Electrical Systems	√	√			
H948 35	Engineering Software Applications	√	√			
H94N 35	Aircraft Gas Turbine Engines	√	√			
H94L 35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	√	√			
DV01 35	Strength of Materials: Advanced	√	√			
H7K2 34	Engineering Mathematics 3	√	√			
H7K3 35	Engineering Mathematics 4	√	√			
H7K4 35	Engineering Mathematics 5	√	√			
DT5T 35	Heat Transfer and Fluid Mechanics	√	√			

5.3 Mapping of Core Skills development opportunities across the qualifications

Opportunities within each Unit, to develop aspects of Core Skills or Core Skill components are highlighted below.

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
H7MB 34	Communication: Practical Skills	E6	E6			S6	S6	S6	S6	S6	S6	S6
H7K1 34	Engineering Mathematics 2			E6								
H94D 34	Physics for Aviation			S6								
H94G 34	Aerodynamics and Flight Mechanics 1	S5			S5			S5		S5	S5	S5
H94F 34	Aircraft Structures and Materials	S5										
H94K 34	Aircraft Propulsion Systems: Introduction	S5		S5								
H9AV 34	Aircraft Engineering: Graded Unit 1			S5	S5			S5		S5		
H7K0 33	Engineering Mathematics 1			E6								
H94A 33	Aircraft Engineering Practical Skills	S5		S5					S5			

E — Embedded Core Skills
S — Signposted Core Skills

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
H949 34	Aircraft Electrical and Electronic Principles	S5		S5								
H94M 34	Aircraft Engineering Systems	S5		S5								
H94V 34	Aircraft Avionics Principles	S5										
H94H 34	Aircraft Hydraulic and Pneumatic Systems	S5		S5								
H94J 34	Human Factors for Aircraft Engineering	S5										
DP5M 34	Aircraft Instruments	S6			S6			S6		S6		
DR1X 34	Computer Aided Draughting for Engineers					S6	S6					
DR1T 34	Statics and Strength of Materials			S6				S6				
DT9P 34	Thermofluids			S6				S6				
D75X 34	Information Technology: Applications Software 1					E6	E6					
H7K2 34	Engineering Mathematics 3			E6								
H94E 34	Aircraft Inspection and Repair	S5			S5			S5		S5	S5	S5
H7K3 35	Engineering Mathematics 4			E6								

E — Embedded Core Skills
S — Signposted Core Skills

Unit code	Unit title	Communication		Numeracy		ICT		Problem Solving			Working with Others	
		Written	Oral	Using Number	Using Graphical Information	Accessing Information	Providing/Creating Information	Critical Thinking	Planning and Organising	Reviewing and Evaluating	Working Co-operatively with Others	Reviewing Co-operative Contribution
DT5T 35	Heat Transfer and Fluid Mechanics	S6		S6	S6			S6		S6		
H94R 35	Aerodynamics and Flight Mechanics 2	S6		S6	S6							
H9AW 35	Aircraft Engineering: Graded Unit 2							S6	S6	S6	S6	S6
H94P 35	Advanced Composite Materials	S6		S6								
H94T 35	Aircraft Avionics and Electrical Systems	S6										
H948 35	Engineering Software Applications			S5	S5	S5	S5		S5			
H94N 35	Aircraft Gas Turbine Engines	S6						S6				
H94L 35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	S5										
DV01 35	Strength of Materials: Advanced			S6				S6				
H7K4 35	Engineering Mathematics 5			E6								

E — Embedded Core Skills
S — Signposted Core Skills

5.4 Assessment Strategy for the qualifications

Unit		Assessment					
		Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6
H7MB 34	Communication: Practical Skills	Assessment for all Outcomes will be conducted in open–book conditions. An extended case study or project could provide a context for integrating Outcomes. For example, Outcome 1 assessment could involve extended reading of one or more reports, papers or articles on current technical issues directly relevant to a written document prepared for Outcome 2. There may be opportunities for learners to explore innovative design ideas, products or services. Group discussion during formative preparation would enhance knowledge and develop essential interpersonal and problem solving skills. For summative assessment purposes, learners should summarise and evaluate one text individually, and record individual responses in writing or orally, using their own words. Further research on aspects of the same topic could be carried out to inform a range of proposals presented and discussed in a meeting (Outcome 3). Alternatively, individual presentations (Outcome 3) could be supported by a written report presenting key information, supporting detail and conclusions/solutions or recommendations (Outcome 2).					
H7K1 34	Engineering Mathematics 2	Written and/or oral recorded evidence, generated under closed-book supervised conditions. Assessment can take place on an Outcome by Outcome basis, or as a single assessment event last no more than 2 hours. Evidence can be generated using different types of assessment. A recommended approach is the use of a question paper. The question paper could be composed of an appropriate balance of short answer, restricted response and structured questions.					
H94D 34	Physics for Aviation	Written and/or oral recorded evidence, generated under closed-book supervised conditions. Holistic assessment is encouraged and learners could be assessed by a single 2 hour closed-book supervised assessment covering all three Outcomes. Alternatively, centres may choose to assess by separate assessments, each of 30 minutes duration for Outcomes 1 and 3, with 1 hour for Outcome 2, or as two or more Outcomes together, under closed-book supervised conditions.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H94G 34	Aerodynamics and Flight Mechanics 1	Written and/or oral recorded evidence, generated under closed-book supervised conditions. The assessment of Outcomes 1, 2 and 3 could be done on an Outcome by Outcome basis or as a combined holistic assessment lasting no more than forty-five minutes. The assessment could be made up of multiple-choice questions. Learners should not know in advance the items on which they will be assessed.			The assessment for Outcome 4 could be a laboratory exercise based on a series of wind tunnel tests. This assessment should be carried out under open-book conditions and all submissions should be the learner's own work.		
H94F 34	Aircraft Structures and Materials	Written and/or oral recorded evidence, generated under closed-book supervised conditions. Holistic assessment is encouraged and learners could be assessed by a single 1.5 hour closed-book assessment covering all three Outcomes after completion of the teaching of the Unit. The assessment could be comprised of a number of multiple choice and extended response questions enabling Unit Evidence Requirements to be met and breadth and depth of learner knowledge to be demonstrated. This assessment approach should reduce the frequency of assessment/re-assessment events and ensure more time is afforded for teaching and learning whilst meeting the Evidence Requirements of the Unit.					
H94K 34	Aircraft Propulsion Systems: Introduction	Written and/or oral recorded evidence, generated under closed-book supervised conditions. Evidence for this Unit could be generated on an Outcome by Outcome basis or as a combined assessment event. The assessment could consist of a mixture and balance of multiple choice and restricted response questions covering all Knowledge and/or Skills items. It is recommended that the total assessment time for all Outcomes should last approximately 1.5 hours.					
H9AV 34	Aircraft Engineering: Graded Unit 1	The assessment is based on two examination papers (Paper 1 and Paper 2) each of 1.5 hours duration. Paper 1 will consist of 30 multiple-choice questions and 10 restricted response questions from the Units Engineering Mathematics 2 and Physics for Aviation. In Paper 2, learners will choose to answer three questions, one from each section (Aerodynamics and Flight Mechanics 1, Aircraft Structures and Materials and Aircraft Propulsion Systems: Introduction). Each section is worth 20 marks.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H94J 34	Human Factors in Aircraft Engineering	Assessment for this Unit could be done on an Outcome by Outcome basis or as part of a combined assessment event. As an example, a combined assessment could take place covering Outcomes 1, 2 and 3 with a separate assessment covering Outcome 4. Evidence for the Knowledge and/or Skills in this Unit will be generated through sampling. Any sampling process must be 'unseen' by the learner before the assessment. That is, learners are expected to fully prepare the range of knowledge and skills and not be able to predict a chosen sample. In this example, the combined assessment could be based on a case study or workplace scenario, issued to the learner in advance of the assessment event. In this case the learner should be allowed sufficient time to familiarise themselves with the key aspects of the study, as a recommendation issued seven days in advance of the assessment. As the assessment is conducted under closed-book supervised conditions, learners will not be allowed to take any pre-prepared notes or materials into the assessment event.					
H94R 35	Aerodynamics and Flight Mechanics 2	Evidence for this Unit could be generated through two assessment events. The assessment of Outcomes 1, 2, and 4 can be combined as a single, holistic closed-book assessment consisting of a mixture and balance of multiple-choice and restricted response questions, lasting no more than 2 hours. Learners should not know in advance the items on which they will be assessed. The second assessment, covering Outcome 3, could be a laboratory exercise. Learners might conduct a series of wind tunnel tests to plot lift and drag curves and a drag polar for an aerofoil section and use the graphical data to determine the optimum angle of attack for the aerofoil and the maximum lift-to-drag ratio. In generating the Evidence Requirements for this assessment, learners will need to show that they can evaluate and interpret information from a variety of sources such as wind tunnel experiments and textbooks, in order to produce a balanced report that is referenced as per the Harvard Referencing format. This assessment should be carried out under open-book conditions and all submissions should be the learner's own work.					
H9AW 35	Aircraft Engineering: Graded Unit 2	This Graded Unit will be assessed by the use of a practical assignment (Aircraft Engineering Project) developed by centres. The project should provide the learner with the opportunity to produce evidence that demonstrates she/he has met the aims of this Graded Unit.					
H7K0 33	Engineering Mathematics 1	It is recommended that the assessment for all three Outcomes takes places at a single end of Unit assessment event. Outcomes may also be assessed individually. All assessments should be unseen, closed-book and carried out under supervised, controlled conditions. The summative assessment of all three Outcomes — whether individually or at a single assessment event — should not exceed 2 hours.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H94A 33	Aircraft Engineering Practical Skills	Evidence for all three Outcomes could be provided by practical tasks carried out under open-book, supervised conditions. Learners should only have access to appropriate documentation provided by the centre such as drawings, task sheets and aircraft documentation/technical instructions. Evidence of learner achievement should be provided by documentation in the form of a log book and check list signed by both learner and assessor for each task completed. A completed artefact, or photographic record, may provide evidence of assessment towards Outcome 1 and Outcome 2.					
H94E 34	Aircraft Inspection and Repair	For Outcomes 1 and 3 learners could be assessed by demonstration, evaluation, and observation of practical tasks. A log book and/or check list could be used and signed off by the learner and assessor encompassing all of the Knowledge and/or skills for each Outcome. To complete Outcomes 1 and 3 successfully learners will have to achieve a satisfactory level of performance in the assessment event/s. Outcome 2 could be assessed in two parts. The first part by demonstration, evaluation, and observation of practical tasks in which their log book and/or check list could be used and signed off by the learner and assessor encompassing all of the Knowledge and/or skills for the Outcome. The second part by the submission of a laboratory report after the completion of a practical task. Assessment for all three Outcomes will be carried out under supervised open-book conditions.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H949 34	Aircraft Electrical and Electronic Principles	Evidence for this Unit could be generated on an Outcome by Outcome basis or as a combined assessment event. As a recommendation, Outcomes 1, 3, 4 and 6 could be assessed as a combined assessment event consisting of a mixture and balance of restricted response and short answer questions. The assessment should last no more than 3 hours. Outcomes 2 and 5 could be assessed through the submission of an investigative report/case study, one during the first semester and the second in the next semester.					
H94M 34	Aircraft Engineering Systems	Assessment for Outcomes 1 to 5 could be done on an Outcome by Outcome basis or as a combined assessment event, under closed-book supervised conditions. Assessment of the Outcomes could consist of a mixture and balance of multiple choice and restricted response questions covering all Knowledge and/or Skills items. It is recommended that the total assessment time for Outcomes 1–5 should last approximately 2 hours.					Written and/or oral recorded evidence, generated under open-book conditions. Evidence could be generated by the submission of an essay/report based on avionic systems used in an aircraft.
H94V 34	Aircraft Avionics Principles	Written and/or oral recorded evidence, generated under closed-book supervised conditions. Assessment for this Unit could be done on an Outcome by Outcome basis or as part of a combined assessment event. As an example, two combined assessments could take place, the first covering Outcomes 1 and 2 and the second Outcomes 3 and 4, each lasting 1 hour and carried out under closed-book supervised conditions. In this example, each assessment could comprise two distinctive parts such as, the first containing a selection of multiple choice response questions and the second part containing restricted response questions. Alternatively, centres may opt to use a single assessment that covers all four Outcomes, lasting 2 hours and carried out under closed-book supervised conditions.					
H94H 34	Aircraft Hydraulic and Pneumatic Systems	Written and/or oral recorded evidence, generated under closed-book supervised conditions. Holistic assessment is encouraged and learners could be assessed by a single 1.5 hour closed-book assessment covering all three Outcomes after completion of the teaching of the Unit. The assessment could be comprised of a number of multiple choice and extended response questions.					

Unit		Assessment					
		Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6
DP5M 34	Aircraft Instruments	Learners are assessed either on an Outcome by Outcome basis or by a single assessment combining all three Outcomes. The assessment papers could be composed of an appropriate balance of short answer, restricted response and structured questions. Assessment should be carried out on a sample basis and under supervised, closed-book, controlled conditions.					
DR1X 34	Computer Aided Draughting for Engineers	In Outcome 1 learners should be asked to produce engineering CAD drawings from given paper drawings and should also be asked to modify these drawings. In Outcome 2 learners should be asked to produce and print composite drawings using standard parts, external drawing files and custom menus. In Outcome 3 learners will be asked to produce 3D drawings.					
DR1T 34	Statics and Strength of Materials	The assessment for both Outcomes in this Unit should be combined together into one assessment paper. This paper should be taken by learners at one single assessment event that should last 1.5 hours. Assessment should be conducted under controlled, closed-book, supervised conditions. Learners should be provided with a formula sheet and are permitted to use a scientific calculator, but not a programmable calculator, in the assessment.					

Unit		Assessment					
		Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6
DT9P 34	Thermofluids	The assessment for all three Outcomes should be combined together into one assessment paper which learners should sit at one single assessment event lasting no more than 2 hours. Assessment should be conducted under controlled, supervised conditions.					
D75X 34	Information Technology: Software Applications	This Unit is largely of a practical nature; it lends itself to a single assessment containing a number of tasks in the form of a project or case study. An observation checklist is required for Outcome 1. Learners will be required to submit evidence in the form of printed documents for both Outcomes 1 and 2. Files should be provided for learners as appropriate to negate the need for them to enter large amounts of text or data. Learners are to have access to on-line help, tutorial support and/or supplier's manuals as required.					
H94P 35	Advanced Composite Materials	Written and/or oral recorded evidence. Holistic assessment is encouraged and learners could be assessed by a single 1.5 hour closed-book supervised assessment covering all three Outcomes. Alternatively, centres may choose to assess Outcomes 1 and 2 as a closed-book supervised 1 hour assessment and Outcome 3 as a report generated under open-book conditions. Closed-book supervised assessment could be comprised of a number of multiple choice and extended response.					
H94T 35	Aircraft Avionics and Electrical Systems	Written and/oral recorded evidence, generated under closed-book supervised conditions. Assessment for this Unit could be done on an Outcome by Outcome basis or by using combined assessment events. As an example, two combined assessments could take place, the first covering Outcomes 1 and 2 and the second Outcomes 3 and 4, each lasting 1 hour. This may be influenced by the order that centres choose to deliver the Unit Outcomes. In this example, each assessment could comprise of two distinctive parts such as, the first containing a selection of multiple choice response questions and the second containing restricted response questions.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H948 35	Engineering Software Applications	Open-book conditions. The assessment for Outcome 1 could be completed out with class time and could involve the learner producing a spreadsheet to solve an engineering based problem, covering all Evidence Requirements. The spreadsheet may utilise custom macros that have already been produced by the learner in class.	Open-book supervised conditions. The assessment for Outcome 2 could focus on the program construction and solution. Outcome 2 assessment should be completed by the learners under supervised open-book conditions. Learners may bring one sheet of A4 paper with their own notes into the exam with them. It is recommended that the assessment last no more than 2 hours.	Open-book conditions. The assessment for Outcome 3 could also be completed out with class time. A 3D model specification could be produced by the lecturer and given to the learners to produce in the software. The model could consist of 3 parts and be assembled, post-processed for analysis and exported to selected engineering application software.			
H94N 35	Aircraft Gas Turbine Engines	Written and/or oral recorded evidence for all Outcomes. Evidence for Outcomes 1, 2, 3 and 4 will be generated under closed-book supervised conditions. Evidence for Outcome 5 will be generated under open-book conditions. Evidence for Outcomes 1, 2, 3 and 4 could be assessed individually or as part of a combined assessment and could consist of a number of appropriately structured short answer restricted response questions, with a time limit of 45 minutes for each Outcome. The assessment for Outcome 5 could be based on a case study investigation into the operating principles of an engine transmission system.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H94L 35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	Written and/or oral evidence, generated under closed-book supervised conditions. Holistic assessment is encouraged and learners could be assessed by a single 1.5 hour closed-book assessment covering all three Outcomes after completion of the teaching of the Unit. The assessment could be comprised of a number of multiple choice and extended response questions.					
DV01 35	Strength of Materials: Advanced	The assessment for Outcome 1 in this Unit should consist of an assessment paper. Learners should undertake this paper at a single assessment event lasting no more than 1 hour conducted under controlled, supervised conditions.	Outcome 2 should be an assignment in which learners are asked to complete a series of tasks covering the assessment criteria. Learners should complete the assignment in 8 hours and should have access to any relevant course notes, textbooks and reference material.				
H7K2 34	Engineering Mathematics 3	A recommended approach is the use of an examination question paper. The question paper should be composed of an appropriate balance of short answer, restricted response and structured questions. The summative assessment of both Outcomes — whether individually or at a single assessment event - should not exceed 2 hours. The assessment should be carried out under closed-book, controlled and invigilated conditions.					
H7K3 35	Engineering Mathematics 4	The assessment of all four Outcomes should take place at a single end of Unit assessment event All assessments should be unseen, closed-book and carried out under supervised, controlled conditions.					

Unit		Assessment					
		Outcome 1	**Outcome 2**	**Outcome 3**	**Outcome 4**	**Outcome 5**	**Outcome 6**
H7K4 35	Engineering Mathematics 5	The recommended approach is the use of an examination question paper. The question paper should be composed of an appropriate balance of short answer, restricted response and structured questions. The questions in the examination should not be grouped by Outcome or be labelled in terms of the Outcomes they relate to. All assessment papers should be unseen by the learners prior to the assessment event and at all times, the security, integrity and confidentiality of assessment papers must be ensured. Assessment should be conducted under closed-book, controlled and invigilated conditions.					
DT5T 35	Heat Transfer and Fluid Mechanics	This Unit lends itself to holistic assessment. The assessment for Outcomes 1, 2, 3 and 4 should be combined together into one assessment paper. This paper should be taken by learners at a single assessment event that should last no more than 2 hours 30 minutes. Assessment should be conducted under closed-booked, controlled, supervised conditions. A formula sheet should be provided to learners.					

6 Guidance on approaches to delivery and assessment

Context and content

The context of the HNC and HND Aircraft Engineering is to contribute to the aircraft engineering capacity and capability building within the aviation industry and, in doing so, provide worthwhile career prospects for learners who successfully achieve these qualifications.

The qualifications develop the technical knowledge, understanding and practical skills relevant to the needs of the modern aircraft engineering industries. The content and structure of each qualification has been designed to give delivery centres the flexibility to provide a course that meets the needs of their learners and their wider stakeholders. This flexibility is achieved through a qualification framework comprising mandatory Units and a wide range of optional Units. The HNC provides a strong foundation of core aircraft engineering principles, technology and skills across the prime discipline areas of aircraft engineering. The HND provides advanced principles and complex applications across the same range of prime disciplines areas but to a deeper level in specialist topics. Flexibility within these Group Awards, especially at HND level, allows courses to be devised to provide some bias in aircraft engineering specialisations, such as aircraft design/analysis or aircraft maintenance operations, as well as facilitating articulation to degree level studies in aircraft or aeronautical engineering.

All aircraft engineering related Units within the HNC and HND are devised to address aspects of aircraft and systems design and maintenance, safety and environmental issues to some extent. Within these specialist Units there is the opportunity to develop knowledge of aviation legislative requirements. Some of these Units also provide the opportunity to develop employability skills.

HNC

The mandatory Units provide the essential fundamental aircraft engineering principles together with a sound grounding in communications and mathematics necessary to prepare for the more advanced studies later in the programme. *Aircraft Engineering: Graded Unit 1* focusses on the integrated application of principles learnt through the mandatory Units, with the exception of the Unit *Communication: Practical Skills*.

Units within the optional section of the HNC allow the flexibility for centres to start the process of specialist development of their learners along separate discipline themes. The majority of Units within an HNC programme allow the further development of the four Core Skills of *Communication, Numeracy, ICT* and *Problem Solving*; where Units with a practical content may provide opportunities to develop the Core Skill of *Working with Others* (refer to Core Skills mapping of Units in Section 5.3).

Where learners are likely to exit with the HNC, rather than progressing to the HND, it is suggested that some aspects of human factors in aircraft engineering are embraced with the learning and teaching of the range of Units where human factors may have a contribution to safety and safe working practices.

HND

The mandatory Units are the same as the HNC with the addition of 4 SQA credits. These additional Units provide the principles and application of *Human Factors in Aircraft Engineering*, advanced principles and application of *Aerodynamics and Flight Mechanics 2*, as well as a double credit Unit *Aircraft Engineering Graded Unit 2. Aircraft Engineering: Graded Unit 2* is a project assignment through which the learner takes responsibility for the formulation, implementation, solution and evaluation of a complex and unfamiliar aircraft engineering problem or issue. Knowledge of Human Factors in aviation is a legal requirement.

A wide range of optional Units allow for the development of specialist knowledge, understanding, analytical skills and practical skills across the broad aircraft engineering themes of Aircraft Design and Maintenance Operations.

It is recommended that learners wishing to progress to university degree studies undertake the optional Units *Engineering Mathematics 4* and *Engineering Mathematics 5*. Further detail on the selection of optional Units for articulation to degree level studies has been provided in Section 6.2.1.

Modes of delivery

The HNC and HND Aircraft Engineering can be delivered on a full-time, part-time day/evening, or block release basis. Centres' capacity to deliver this Group Award on an Open or e-learning/assessment basis will depend upon the availability of appropriate internet-based learning systems and materials suitable for these modes of delivery.

In timetabling the qualification, centre staff should take account of information contained in the 'Recommended entry to the Unit' statement in each individual Unit specification when sequencing the delivery of Units.

A suggested delivery sequence of Units to achieve the HNC and HND Aircraft Engineering via a full-time two-year programme is presented in Section 6.1 of this document. This information is presented for delivery on the basis of a two-semester academic session.

Approaches to Learning and Teaching

Lecturers should use a variety of learning and teaching approaches in the delivery of the Units for the HNC and HND. These may include lectures, tutorials, laboratory work, workshop exercises, computer simulations, investigations, case studies, group assignments and project activities. Comprehensive use of learner-centred practical work, both laboratory and workshop, should be integrated into the course delivery in recognition of the high value learning stemming from hands-on activities. Use or reference to relevant regulation and guidance through EASA and CAA documents is recommended where appropriate, as are Original Equipment Manufacturers technical specifications of aircraft and components.

The use of open learning and online materials is suggested to supplement formal teaching and to promote independent learning. Centres are also encouraged to develop their wider capability to deliver appropriate elements by making use of e-activities for learning and assessment.

Industrial visits are encouraged wherever possible to provide an insight into real working environments and applications within the aircraft engineering business that endorses college learning.

Lecturers should also seek to integrate Core Skills development opportunities at every possibility within the learning and teaching programme. Opportunities to develop Core Skills are detailed in each individual Unit specification can be found in Section 5.3.

Assessment Approaches

Design of the HNC and HND has sought to reduce the summative assessment load on learners as well as integrating some of the learning into assessment activities. In many aircraft engineering Units this has been accomplished by greater use of integrating assessments across a number of Outcomes in individual Units, as well as greater use of novel assessments. This process was aided by a consistent approach to recommended approaches to assessment across all new and revised aircraft engineering Units within the HNC and HND.

A wide range of approaches to assessment is employed across the Units comprising the HNC and HND. These include traditional assessment by written and/or oral examination, either numerical or narrative, or both, which may include a variety of question types such as multiple choice, short answer restricted response and longer structured questions. New and revised Units have also made better use of coursework reports and essay type assessment which are ideal for assessing learner competence in practical and investigative aspects of the HNC and HND.

Formative assessment is recommended throughout the delivery of the Units to reinforce learning, build learners' confidence and prepare learners for summative assessment.

Good Assessment Practice

From a quality assurance and control of consistency aspect, it is good practice to actively encourage delivery centres to work in partnership in producing Graded Unit assessment materials, which meet nationally agreed standards reducing, in turn, the workload on staff in individual centres. It is particularly important to ensure that consistent and rigorous internal and external moderation procedures operate throughout at Unit and Graded Unit level. This places a clear responsibility on all centres and SQA.

6.1 Sequencing/integration of Units

The tables below suggest a delivery sequence of Units in a two-semester delivery format. Timetabling of assessments is at the discretion of the delivering centre, with the exception of schedules which affect more than one centre, for example, *Aircraft Engineering: Graded Unit 1*.

Suggested delivery sequence of Units comprising a specimen HNC and 1st year of the HND for full-time delivery in a two-semester academic year format					
SEMESTER 1			**SEMESTER 2**		
Unit Code	**Unit Title**	**SQA Credit**	**Unit Code**	**Unit Title**	**SQA Credit**
H7MB 34	Communication: Practical Skills	1	H94G 34	Aerodynamics and Flight Mechanics 1	1
H7K1 34	Engineering Mathematics 2	1	DR1T 34	Statics and Strength of Materials	1
H94D 34	Physics for Aviation	1	H94M 34	Aircraft Engineering Systems	2
H94F 34	Aircraft Structures and Materials	1	H94K 34	Aircraft Propulsion Systems: Introduction	1
H949 34	Aircraft Electrical and Electronic Principles	2	H94A 33	Aircraft Engineering Practical Skills	1
DR1X 34	Computer Aided Draughting for Engineers	1	H9AV 34	Aircraft Engineering: Graded Unit 1	1
H94A 33	Aircraft Engineering Practical Skills	1			
TOTAL SQA CREDITS		**8**	**TOTAL SQA CREDITS**		**7**

Suggested delivery sequence of Units comprising a specimen 2nd year of the HND for full-time delivery in a two-semester academic year format					
SEMESTER 1			**SEMESTER 2**		
Unit Code	**Unit Title**	**SQA Credit**	**Unit Code**	**Unit Title**	**SQA Credit**
H7K2 34	Engineering Mathematics 3	1	H7K4 35	Engineering Mathematics 4	1
H94V 34	Aircraft Avionics Principles	1	H94T 35	Aircraft Avionics and Electrical Systems	2
DT5T 34	Heat Transfer and Fluid Dynamics	1	H94N 35	Aircraft Gas Turbine Engines	2
DV01 35	Strength of Materials: Advanced	1	H9AW 35	Aircraft Engineering: Graded Unit 2	2
H94P 35	Advanced Composite Materials	1			
H948 35	Engineering Software Applications	1			
H94R 35	Aerodynamics and Flight Mechanics 2	1			
H94J 34	Human Factors in Aircraft Engineering	1			
TOTAL SQA CREDITS		**8**	**TOTAL SQA CREDITS**		**7**

6.2 Recognition of Prior Learning

SQA recognises that learners gain knowledge and skills acquired through formal, non-formal and informal learning contexts.

In some instances, a full Group Award may be achieved through the recognition of prior learning. However, it is unlikely that a learner would have the appropriate prior learning and experience to meet all the requirements of a full Group Award.

The recognition of prior learning may **not** be used as a method of assessing in the following types of Units and assessments:

- HN Graded Units
- Course and/or external assessments
- Other integrative assessment Units (which may or not be graded)
- Certain types of assessment instruments where the standard may be compromised by not using the same assessment method outlined in the Unit
- Where there is an existing requirement for a licence to practice
- Where there are specific health and safety requirements
- Where there are regulatory, professional or other statutory requirements
- Where otherwise specified in an Assessment Strategy

More information and guidance on the *Recognition of Prior Learning* (RPL) may be found on our website **www.sqa.org.uk**.

The following sub-sections outline how existing SQA Unit(s) may contribute to this Group Award. Additionally, they also outline how this Group Award may be recognised for professional and articulation purposes.

6.2.1 Articulation and/or progression

The HNC Aircraft Engineering is devised to provide progression to the HND Aircraft Engineering.

The HND Aircraft Engineering, through the selection of certain optional Units, is devised to articulate to BEng degrees in Aircraft and Aeronautical Engineering. In particular, the HND is devised to articulate to the 3rd year of the BEng Aircraft Engineering at the University of the Highlands and Islands (UHI) and to the 3rd year BEng Aircraft Engineering at the University of the West of Scotland (UWS). The table below shows a suggested selection of HND optional Units suitable for articulation to degree level at Year 3 (SCQF level 9).

Unit Code	Unit Title	SCQF level	SQA Credit
H94A 33	Aircraft Engineering Practical Skills	6	2
H949 34	Aircraft Electrical and Electronic Principles	7	2
H94M 34	Aircraft Engineering Systems	7	2
H94V 34	Aircraft Avionics Principles	7	1
DR1X 34	Computer Aided Draughting for Engineers	7	1
DR1T 34	Statics and Strength of Materials	7	1
H94P 35	Advanced Composite Materials	8	1
H94T 35	Aircraft Avionics and Electrical Systems	8	2
H948 35	Engineering Software Applications	8	1
H94N 35	Aircraft Gas Turbine Engines	8	2
DV01 35	Strength of Materials: Advanced	8	1
DT5T 35	Heat Transfer and Fluid Mechanics	8	1
H7K3 35	Engineering Mathematics 4	8	1
	TOTAL SQA CREDITS		**8**

6.2.2 Professional recognition

Design of the revised qualifications has taken cognisance of the educational requirements of the UK Engineering Councils' standards specification (UK-SPEC) for professional recognition at Engineering Technician level. Section 5.2.2 of this document provides a mapping of HNC and HND Units to these standards.

The UK-SPEC provides individuals with two routes to achieve recognition of achievement of the educational components of the registration standards: those who hold an accredited qualification and those that do not.

Qualifications are accredited through a relevant professional institution, such as the Royal Aeronautical Society, in conjunction with a centre delivering that qualification. UK engineering professional bodies do not accredit national qualifications as the accreditation process includes assessing teaching staff credentials, facilities and equipment to support the qualification delivery, the assessment process and links with industry. Consequentially, individual delivery Centre's will need to seek their own recognition to provide their successful learners with the benefits that this brings.

Individuals who do not hold an accredited qualification can apply through a relevant engineering professional body for recognition of achievement of the educational components on the basis of Recognition of Prior Learning.

6.2.3 Transitional Arrangements

The HNC Aircraft Engineering legacy qualification (G800 15) will finish on 31 July 2018 to accommodate part-time and distance learning students as well as for re-assessment.

The HND Aircraft Engineering legacy qualification (G8GE 16) will finish on 31 July 2019, to accommodate learners progressing from the legacy HNC qualification, part-time and distance learning students as well as for re-assessment.

However, centres may use the credit transfer mapping arrangements in Section 6.2.4 to transfer legacy HNC learners onto the revised HND programme.

6.2.4 Credit transfer

All decisions relating to credit transfer remain with centres. However, the table below provides details and guidance on credit transfer arrangements agreed by the Qualifications Development Team. Units that have not been included in this table do not attract full or partial credit transfer.

Centres must retain proof of all credit transfer arrangements (normally a photocopy of the learner's Scottish Qualifications Certificate) for the purposes of internal and external verification.

New Unit Code	New Unit Title	Old Unit Code	Old Unit Title	Credit Transfer	Comments
H94F 34	Aircraft Structures and Materials	DP5P 34	Aircraft Structures and Materials	Yes	–
H94K 34	Aircraft Propulsion Systems: Introduction	DR09 34	Aircraft Propulsion Systems: Introduction	Partial	Outcomes 1 and 2 in the new Unit are matched by the old Unit. Aspects of Outcomes 3 and 4 in the new Unit are not matched by the old Unit. Therefore, to gain credit transfer to the new Unit learners will need to provide additional evidence in respect of the Knowledge and/or Skills for lubrication in Outcome 3 of the new Unit and Knowledge and/or Skills in respect of starting and ignition systems in Outcome 4 of the new Unit.
H94J 34	Human Factors for Aircraft Engineering	DR08 34	Human Factors for Aircraft Engineering	Yes	–
H94N 35	Aircraft Gas Turbine Engines	F0M6 35	Aircraft Gas Turbine Engines	Partial	Outcomes 1, 2 and 4 in the new Unit are matched by the old Unit. To gain credit transfer to the new Unit learners will need to provide additional evidence relating to the Knowledge and/or Skills in Outcome 3 of the new Unit in respect of propellers and blade theory and all of the Knowledge and/or Skills in Outcome 5.
H94E 34	Aircraft Inspection and Repair	F0M7 35	Aircraft Inspection and Repair	Yes	–

New Unit Code	New Unit Title	Old Unit Code	Old Unit Title	Credit Transfer	Comments
H94H 34	Aircraft Hydraulic and Pneumatic Systems	DR02 34	Aircraft Hydraulic and Pneumatic Systems	Yes	–
H949 34	Aircraft Electrical and Electronic Principles	DR06 34 and DR07 34	Electrical Fundamentals for Aviation and Electronic Fundamentals for Aviation	Yes	Both DR06 34 and DR07 34 required for credit transfer. Outcomes 1 and 2 of the new Unit are covered by DR06 34. Outcomes 3, 4, 5 and 6 of the new Unit are covered by DR07 34.
H94A 33	Aircraft Engineering Practical Skills	DP5R 33 and DR0D 33 and DP5L 33	Practical Aircraft Skills and Aircraft Electrical and Electronic Skills and Aircraft Maintenance Skills	Yes	All three Units (DP5R 33, DR0D 33 and DP5L 33) required for credit transfer. Outcome 1 of the new Unit is covered by DP5R 33. Outcome 2 of the new Unit is covered by DR0D 33. Outcome 3 of the new Unit is covered by DP5L 33 although fault detection and diagnosis is only implied.
H94L 35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	F0M5 35	Aircraft Environmental Systems: Cabin Conditioning and Pressurisation	Yes	–

New Unit Code	New Unit Title	Old Unit Code	Old Unit Title	Credit Transfer	Comments
H94G 34	Aerodynamics and Flight Mechanics 1	DR0C 34 and DR03 34	Aerodynamics and Aircraft Systems: Flight Controls	Partial	Both Units required. To gain credit transfer to the new Unit learners will need to provide additional evidence relating to the Knowledge and/or Skills in Outcome 2 (design aspects), drag polars in Outcome 3 and all of the Knowledge and/or Skills in Outcome 4. Knowledge and/or skills for Outcome 4 of the new Unit are similar to that provided by Outcome 4 of DR03 34.
H94M 34	Aircraft Engineering Systems	DR03 34 and DR02 34 and DR09 34 and DR05 34	Aircraft Systems: Flight Controls and Aircraft Hydraulic and Pneumatic Systems and Aircraft Propulsion Systems: Introduction and Avionics	Partial	All 4 Units (DR03 34, DR02 34, DR09 34 and DR05 34) required. Outcome 1 of the new Unit is covered by DR03 34. Outcome 2 of the new Unit is covered by DR02 34. Outcome 4 of the new Unit is covered by DR09 34. Outcome 6 of the new Unit is covered by DR05 34. To gain credit transfer to the new Unit, learners will need to provide additional evidence to meet Outcomes 3 and 5 of the new Unit.

New Unit Code	New Unit Title	Old Unit Code	Old Unit Title	Credit Transfer	Comments
H7K0 33	Engineering Mathematics 1	DG4H 33	Mathematics for Engineering 1: Electronics and Electrical	Partial	To gain credit transfer to the new Unit learners will have to provide additional evidence relating to functions as specified in the Evidence Requirements in respect of the first three knowledge/skills in Outcome 1 and relating to vectors as specified in the first three knowledge/skills in Outcome 3.
H7K0 33	Engineering Mathematics 1	DT5X 33	Mathematics for Engineering 1: Mechanical and Manufacturing	Partial	To gain credit transfer to the new Unit learners will have to provide additional evidence relating to functions as specified in the Evidence Requirements in respect of the first three knowledge/skills in Outcome 1 and relating to 3D vectors and complex numbers as specified in the knowledge/skills in Outcome 3.
H7K1 34	Engineering Mathematics 2	DG4L 34	Mathematics for Engineering 2	Partial	To gain credit transfer to the new Unit learners will have to provide additional evidence relating to trigonometric and hyperbolic functions as specified in the Evidence Requirements in respect of Outcome 1.

6.3 Opportunities for e-assessment

E-learning opportunities within the HNC and HND depend on the type and amount of face-to-face learning and assessment required within a Unit. In addition, centres will need appropriate internet based learning and assessment systems (VLE) together with the availability of e-learning and assessment materials.

Further information on opportunities for e-assessment can be found in each individual Unit specification.

6.4 Support materials

Assessment support packs (ASPs) will be available for all mandatory Units, including *Aircraft Engineering: Graded Unit 1*.

A **list of existing ASPs** is available to view on SQA's website.

6.5 Resource requirements

To maintain a quality learning experience for learners, it is recommended that teaching staff have a structured plan for Continued Professional Development to keep abreast of new and emerging technologies in their specialist discipline areas, as well as in developments in approaches to learning and assessment. It is also recommended that staff have some experience of working within the aircraft engineering sector and that contact is maintained with the industry.

Individual Unit specifications highlight the specific physical resources that are essential to the delivery of a Unit.

While not all Units require practical activities, centres are strongly recommended to provide learners with access to practical facilities to supplement classroom teaching and to develop practical skills relevant to aircraft engineering.

Electronic resources that would enhance learning in a modern teaching environment include:

- Computer availability with internet access
- Projection systems and smart boards for teaching
- Virtual Learning Environment for online learner support

A range of facilities and equipment to support practical learning and assessment activities include:

- Mechanical and electrical/electronic workshops and laboratories
- Aircraft mechanical/electrical components and assemblies
- Access to a complete aircraft for assembly/disassembly and maintenance practices
- Access to a subsonic wind tunnel for aerodynamic testing
- A range of instrumentation for mechanical and electrical/electronic measurements

A range of software platforms to support computer-based learning and assessment activities include:

- Business software — word processing, spreadsheet, presentations, project management
- CAD software
- Numerical analysis software
- Engineering simulation software

Access to a good range of aircraft engineering and mathematics textbooks as well as periodicals relevant to aircraft engineering for learner use is essential.

7 General information for centres

Equality and inclusion

The Unit specifications making up this Group Award have been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners will be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

Internal and external verification

All instruments of assessment used within this/these qualification(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* **(www.sqa.org.uk/GuideToAssessment)**.

8 Glossary of terms

Embedded Core Skills: is where the assessment evidence for the Unit also includes full evidence for complete Core Skill or Core Skill components. A learner successfully completing the Unit will be automatically certificated for the Core Skill. (This depends on the Unit having been successfully audited and validated for Core Skills certification.)

Finish date: The end of a Group Award's lapsing period is known as the finish date. After the finish date, the Group Award will no longer be live and the following applies:

- learners may not be entered for the Group Award
- the Group Award will continue to exist only as an archive record on the Awards Processing System (APS)

Graded Unit: Graded Units assess learners' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage learners to retain and adapt their skills and knowledge.

Lapsing date: When a Group Award is entered into its lapsing period, the following will apply:

- the Group Award will be deleted from the relevant catalogue
- the Group Award specification will remain until the qualification reaches its finish date at which point it will be removed from SQA's website and archived
- no new centres may be approved to offer the Group Award
- centres should only enter learners whom they expect to complete the Group Award during the defined lapsing period

SQA credit value: The credit value allocated to a Unit gives an indication of the contribution the Unit makes to an SQA Group Award. An SQA credit value of 1 given to an SQA Unit represents approximately 40 hours of programmed learning, teaching and assessment.

SCQF: The Scottish Credit and Qualification Framework (SCQF) provides the national common framework for describing all relevant programmes of learning and qualifications in Scotland. SCQF terminology is used throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at **www.scqf.org.uk**.

SCQF credit points: SCQF credit points provide a means of describing and comparing the amount of learning that is required to complete a qualification at a given level of the Framework. One National Unit credit is equivalent to 6 SCQF credit points. One National Unit credit at Advanced Higher and one Higher National Unit credit (irrespective of level) is equivalent to 8 SCQF credit points.

SCQF levels: The level a qualification is assigned within the framework is an indication of how hard it is to achieve. The SCQF covers 12 levels of learning. HNCs and HNDs are available at SCQF levels 7 and 8 respectively. Higher National Units will normally be at levels 6–9 and Graded Units will be at level 7 and 8. National Qualification Group Awards are available at SCQF levels 2–6 and will normally be made up of National Units which are available from SCQF levels 2–7.

Subject Unit: Subject Units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Signposted Core Skills: refers to opportunities to develop Core Skills arise in learning and teaching but are not automatically certificated.

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. This document is the latest version and incorporates the changes summarised below. Centres are advised to check SQA's APS Navigator to confirm they are using the up to date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- No new centres may be approved to offer the Unit which has been revised.
- Centres should only enter learners for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version Number	Description	Date

Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of this qualification.

9 General information for learners

This section will help you decide whether this is the qualification for you by explaining what the qualification is about, what you should know or be able to do before you start, what you will need to do during the qualification and opportunities for further learning and employment.

The HNC and HND in Aircraft Engineering will allow you to develop knowledge, understanding and practical skills to embark on, or further a career in the modern aircraft engineering business, whether this be in aircraft design and manufacturing industries or aircraft operations/maintenance and repair organisations.

The HNC consists of 7 mandatory SQA Unit credits, and 5 optional SQA Unit credits. Mandatory Units include *Engineering Mathematics 2*, *Physics for Aviation, Aerodynamics and Flight Mechanics 1, Aircraft Structures and Materials*, and *Aircraft Propulsion Systems*.

The HND consists of 12 mandatory SQA Unit credits, and 18 optional SQA Unit credits. As well as the mandatory Units included in the HNC, you will also complete the Units *Human Factors for Aircraft Engineering* and *Aerodynamics and Flight Mechanics 2*.

The HNC includes one Graded Unit, while the HND includes two Graded Units. The purpose of the Graded Unit is to assess your ability to apply and integrate knowledge and skills gained throughout the Units within the qualification.

Many of the Units provide opportunities to develop Core Skills, particularly in *Communication, Numeracy, Problem Solving* and *Working with Others*.

Entry to the qualifications is at the discretion of the delivering centre. However, recommended qualifications and/or experience include:

- National 5 English or equivalent (SCQF level 5)
- Plus one of the following:
  - At least one Higher (SCQF level 6) or equivalent in Mathematics or Physics
  - SQA National Certificate (NC) in an engineering discipline at SCQF level 6
  - SVQ level 3 in Aeronautical Engineering (SCQF level 6)
  - EASA Part 66 Category A for aircraft certifying mechanics (SCQF level 6)

The HNC and HND in Aircraft Engineering can be delivered on a full-time, block-release, open or blended learning, part-time day or part-time evening basis at the discretion of the delivering centre.

A variety of assessment styles are employed through the HNC and HND including supervised closed-book examinations. Assessments may include the use of multiple choice questions, investigative report writing including experimental work and case studies, and practical work including product development, installation and repair as well as software applications.

These qualifications are recognised as contributing to the education requirement for professional registration as an Engineering Technician.

Successful completion of the HND may provide opportunities to progress to degree level studies in aircraft or aeronautical engineering.