Higher National Graded Unit Specification

General Information for Centres

This Graded Unit has been validated as part of the HNC/HND Aircraft Engineering**.** Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

Graded Unit Title: Aircraft Engineering: Graded Unit 2

Graded Unit Code: F1FX 35

Type of Graded Unit: Project

Assessment Instrument: Practical Assignment

Credit points and level: 2 HN Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8*)

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

Purpose: This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the HND award in Aircraft Engineering:

- Develop the candidate's ability to apply analysis and synthesis skills to the solution of aircraft engineering problems.
- Develop the candidate's learning and transferable skills (including Core Skills).
- Develop the candidate's knowledge and skills in planning, scheduling and project management.
- Develop the candidate's investigation skills.
- Develop a range of Communication knowledge and skills relevant to the needs of aircraft incorporated engineers.
- Develop knowledge, understanding and skills in a range of core aircraft principles.
- Expand on the range of knowledge, understanding and skills in the core HND Aircraft Principles and Technology section.
- Allow for further specialisation within the following subject areas: Avionics, Mechanics, Design, Manufacture and Maintenance.

General Information for Centres (cont)

Recommended Prior Knowledge and Skills: It is recommended that the candidate should have completed or be in the process of completing the following Units relating to the above specific aims prior to undertaking this Graded Unit:

- HND Mandatory Units *plus*
- Relevant optional Units from:

  — DR1R 35 *Computer Aided Engineering (CAE) and Prototyping*
  — F0M1 35 *Aircraft Servo Control Systems*
  — F0M2 35 *Aircraft Automatic Flight and Landing Systems*
  — F0M3 35 *Communication and Navigation Systems for Aviation*
  — F0M4 35 *Aircraft Electronic Techniques*
  — F0M5 35 *Aircraft Environmental Systems: Cabin Conditioning and Pressurisation*
  — F0M6 35 *Aircraft Gas Turbine Engines*
  — F0M7 35 *Aircraft Inspection and Repair*
  — F0M8 35 *Aircraft Landing Gear*
  — F0M9 35 *Radio and Radar Principles for Aviation*
  — F0YB 35 *Aircraft Electrical Power Systems*

The nature of the project activity detailed in this Specification is such that it is likely that centres will wish their candidates to embark on it from the start of the second year of the HND Aircraft Engineering programme. As it is anticipated that centres will deliver the HNC Aircraft Engineering as part of the first year of the HND, it is recommended that candidates have completed all HNC Aircraft Engineering Units before commencing this project.

In principle, the project can draw on any Units in the HND Aircraft Engineering Framework although the majority of the Units should be at SCQF level 8. The project can be taken from one Aircraft Engineering area (eg Avionics) or it can span more than one technical area. However, its principal purpose is not to integrate technical content (this is covered in Aircraft Engineering: Graded Unit 1) but rather to combine such knowledge and skills as planning, scheduling, construction, testing, evaluating and reporting.

Core Skills:

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill	Problem Solving at SCQF Level 6
Core Skill component	None

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

Assessment: This Graded Unit will be assessed by the use of a practical assignment (Aircraft Engineering Project). The developed practical assignment should provide the candidates with the opportunity to produce evidence that demonstrates they have met the aims of the Graded Unit that it covers.

In developing this specification it was decided that candidates must do a clearly identifiable individual project. However, this does not preclude individual projects being part of a larger group project.

Candidates' contribution to a larger group project has the advantage of creating opportunities for the development of the Core Skill, Working with Others.

Administrative Information

Graded Unit Code: F1FX 35

Graded Unit Title: Aircraft Engineering: Graded Unit 2

Original date of publication: August 2006

Version: 02

History of Changes:

Version	Description of change	Date
02	Core Skill Problem Solving at SCQF level 6 embedded.	28/07/2015

Source: SQA

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

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

Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates

Graded Unit Title: Aircraft Engineering: Graded Unit 2

Conditions of Assessment

The candidate should be given a date for completion of the practical assignment (Aircraft Engineering Project). However, the instructions for the assessment task should be distributed to allow the candidate sufficient time to assimilate the details and carry out the assessment task. During the time between the distribution of the assessment task instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance. The assessment task should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the candidate's evidence at the time of the completion date.

At this level, candidates should work independently. It is up to centres to take reasonable steps to ensure that the project is the work of the candidate. For example, centres may wish to informally question candidates at various stages on their knowledge and understanding of the project on which they have embarked. Centres should ensure that where research etc. is carried out in other establishments or under the supervision of others that the candidate does not receive undue assistance.

The evidence for the project is generated over time and involves three distinct stages, where each stage has to be achieved before the next is undertaken. Thus any reassessment of stages must be undertaken before proceeding to the next stage.

If a candidate fails the project overall or wishes to upgrade, then this must be done using a *substantially different* project, ie all stages are undertaken using a new project, assignment, case study, etc. In this case, a candidate's grade will be based on the achievement in the ***reassessment.***

Instructions for designing the assessment task

The assessment task is a project. The project undertaken by the candidate must be a complex task which involves:

- variables which are complex or unfamiliar
- relationships which need to be clarified
- a context which may be familiar or unfamiliar to the candidate

The project will support the broad manufacturing or maintenance aims of the course and may consist of one of the following:

- aircraft hardware only
- aircraft hardware and software
- an aircraft component or system design (which may include the use of software)
- feasibility investigation of an aeronautical technical issue leading to a report with a clear set of recommendations

Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)

Examples of such projects include the following:

- installation of aircraft equipment (eg avionics upgrade, engine)
- design of some form of structure (eg Significant Repair to a flight surface)
- investigation into the requirements for an aircraft 'C' or 'D' check

The assessment task requires the candidate to:

- produce a project brief and specification
- produce project objectives which define the long term project objectives
- draw up an initial project schedule which should be used to inform on-going project planning and development
- justify chosen project solution in relation to one or more alternative solutions
- develop a verification strategy for the project
- feed back to project supervisor on a regular basis
- access components, software, materials or materials for an investigation
- implement project solution
- test product or check investigation data to confirm validity of this data
- analyse test results or investigation data
- maintain a log book throughout the duration of the project
- complete a project report which conforms to appropriate report standards, includes an evaluation of the project strategy and what the candidate has learnt from undertaking the project
- present details of the project including a reflective account of the project Outcomes

Guidance on grading candidates

Candidates who meet the minimum Evidence Requirements will have their achievement graded as C — competent, or A — highly competent or B somewhere between A and C. The grade related criteria to be used to judge candidate performance for this Graded Unit is specified in the following table.

It should be noted that in the following table the term 'product' could mean one of the following:

- aircraft hardware only
- aircraft hardware and software
- aircraft component or system design (which may include the use of software)
- feasibility study of an aeronautical technical issue leading to a report with a clear set of recommendations

Whichever category is chosen, the project must relate to a practical situation demonstrating how aircraft engineering is utilised in the service of society.

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Grade A	Grade C
Is a seamless coherent piece of work which:	Is a co-ordinated piece of work which:
♦ The project brief includes all relevant information, is clear and concise and has been agreed fully with the customer.	♦ The project brief includes complex, multi-variable information about the main technical requirements of the project and provides a cost indication and expected timescales.
♦ The project specification is well structured, contains relevant, accurate information and any revisions made have been agreed with the customer.	♦ The project specification provides clear details of the following: the title of the project; the objectives of the specification; the project's main technical requirements including multi-variables and an acknowledgement of any references or standards relevant to the specification.
♦ The project objectives accurately and fully reflect the long term project targets.	♦ The project objectives identify the key long term project targets and multi-variables.
♦ The initial project schedule (probably in the form of a Gantt chart) contains a comprehensive list of project activities and timings. The information in the initial schedule is used to assess if the project can be completed within timescales. The schedule is monitored on a regular basis to inform on-going project planning and development.	♦ The initial project schedule (probably in the form of a Gantt chart) shows all essential project activities and timings. Evidence that the schedule has been monitored on at least three separate occasions during the life of the project to inform on-going project planning and development should be available.
♦ The candidate develops a substantial knowledge base to support the demands of the project.	♦ The candidate develops a sound knowledge base to support the demands of the project.
♦ The selected solution is justified in terms of a thorough evaluation of a range of options.	♦ The selected solution is justified in terms of a sound evaluation involving the solution and at least one viable alternative option.
♦ A comprehensive verification strategy is developed to ensure the product is completely tested or the investigation findings are fully validated.	♦ A verification strategy is developed to test the essential parts of the product or to validate the principal investigation findings.
♦ The candidate feeds back to her/his supervisor on a regular basis, updating the supervisor on progress made and actions for the next stage of the project	♦ The candidate feeds back to her/his supervisor on at least three occasions providing an indication of progress made

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Grade A	Grade C
♦ The candidate accesses component and/or software and/ or materials to support an investigation of the correct specification from a range of sources at the most economic price	♦ The candidate accesses components and/or software and/ or materials to support an investigation of the correct specification from a range of sources
♦ The product is constructed to a high standard and functions correctly or the investigation is carried out in a comprehensive manner	♦ The product is constructed to an acceptable standard of quality or the investigation is carried out in a sufficiently detailed manner
♦ All tests on the product are conducted in a technically correct way with due account being taken of inaccuracies introduced by the measurement processes or comprehensive checks are made on investigation data to ensure full confidence in the reliability and accuracy data.	♦ Tests are carried out in a technically proficient way or sufficient checks are made on the investigation data to ensure reasonable confidence in the reliability and accuracy of the data.
♦ The interpretation of test results or investigation data is accurate and the analysis of the results or data is used to identify improvements in product performance or the Outcomes of the investigation.	♦ The interpretation of test results or investigation data is correct.
♦ The log book is regularly maintained and provides a detailed, informal record of the candidate's thinking as the project develops including reflective comments.	♦ The log book contains a complex level of detail about project ideas and progress and there is evidence that entries have been made on at least six occasions during the life of the project.
♦ The project report is well structured, contains only relevant information, has clear and accurate conclusions and recommendations and uses clear and correct English.	♦ The project report meets acceptable standards in terms of structure, use of English and clarity, and has accurate conclusions and recommendations.
♦ The project report includes a complex and comprehensive evaluation of the project strategy and activities and includes clear evaluation of what the candidate has learnt from undertaking the project and the factors involved.	♦ The project includes an evaluation of the project strategy and activities and includes an evaluation of what the candidate has learnt from undertaking the project.
♦ The presentation is well structured, contains only relevant information, is to time and includes the use of appropriate aids.	♦ The presentation is acceptably structured, contains largely relevant information and is to time.

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Grade A	Grade C
♦ The candidate gives clear, concise and technically accurate answers to questions raised during the presentation.	♦ The candidate gives technically correct answers to questions raised as part of the presentation.
♦ The candidate includes a complex, reflective account of the success, or otherwise, of project activities against project objectives in the presentation.	♦ The candidate includes a reflective account of the success, or otherwise, of the project in the presentation.
♦ The candidate undertakes the project with the minimum of supervision.	♦ The candidate undertakes the project without unnecessary interventions from the project supervisor to ensure the project remains on track.
♦ The candidate identifies clear and full details of the new knowledge and skills she/he has developed as a result of doing the project such as project management skills, investigation/research skills, keeping to deadlines, recognising limitations of knowledge — approaching expert sources.	♦ The candidate provides at least three examples of new knowledge and skills she/he has developed as a result of doing the project.
♦ The candidate introduces a significant novel feature into the project.	♦ None
♦ The candidate demonstrates a high level of self–motivation throughout the project.	♦ The candidate demonstrates an acceptable level of motivation throughout the project.
♦ The candidate undertakes additional research well beyond that demanded by the project.	♦ None

The project will be marked out of 100. Assessors will mark each stage of the project, taking into account the criteria outlined. The marks will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the candidate for this Graded Unit based on the following grade boundaries.

A = 70% — 100%
B = 60% — 69%
C = 50% — 59%

Note: the candidate must achieve all of the minimum evidence specified above for each stage of the project in order to achieve the Graded Unit.

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Important Note:

Centres **must** complete the following Grading Checklist for each Aircraft Engineering Project.

Completed checklists will be used as part of the external verification process to ensure the accuracy and consistency of grading between candidates in a centre and across centres.

Notes on completion of the Grading Checklist are shown on page 16.

Scottish Qualifications Authority

Aircraft Engineering Project: Graded Unit 2

Grading Unit Checklist

Centre Name: _____

Centre Number: _____

Grading Checklist

No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
1	Yes	The project brief includes complex, multi-variable information about the main technical requirements of the project and provides a cost indication and expected timescale.	Yes	Yes	Yes	The project brief includes all relevant information, is clear and concise and has been agreed fully with the customer.
2	Yes	The project specification provides clear details of the following: the title of the project; the objectives of the specification; the project's main technical requirements including multi-variables and an acknowledgement of any references or standards relevant to the specification.	Yes	Yes	Yes	The project specification is well structured, contains relevant, accurate information and any revisions have been agreed with the customer.
3	Yes	The project objectives identify the key long term project targets and multi-variables.	Yes	Yes	Yes	The project objectives accurately and fully reflect the long-term project targets.
4	Yes	The initial project schedule (probably in the form of a Gantt chart) shows all essential project activities and timings. Evidence that the schedule has been monitored on at least three separate occasions during the life of the project to inform on-going project planning and development should be available.	Yes	Yes	Yes	The initial project schedule (probably in the form of a Gantt chart) contains a comprehensive list of project activities and timings. The information in the initial schedule in used to assess if the project can be completed within the timescales. The schedule is monitored on a regular basis to inform on-going project planning and development.

Grading Checklist (cont)

No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
5	Yes	The candidate develops a sound knowledge base to support the demands of the project.	Yes	Yes	Yes	The candidate develops a substantial knowledge base to support the demands of the project.
6	Yes	The selected solution is justified in terms of a sound evaluation involving the solution and at least one viable alternative option.	Yes	Yes	Yes	The selected solution is justified in terms of a thorough evaluation of a range of options.
7	Yes	A verification strategy is developed to test the essential parts of the product or to validate the principal investigation findings.	Yes	Yes	Yes	A comprehensive verification strategy is developed to ensure the product is completely tested or the investigation findings are fully validated.
8	Yes	The candidate feeds back to her/his supervisor on at least three occasions providing an indication of progress made.	Yes	Yes	Yes	The candidate feeds back to her/his supervisor on a regular basis, updating the supervisor on progress made and actions for the next stage of the project.
9	Yes	The candidate accesses components and/or software and/or materials to support an investigation of the correct specification from a range of sources.	Yes	Yes	Yes	The candidate accesses component and/or, software and/ or materials to support an investigation of the correct specification from a range of sources at the most economic price.

Grading Checklist (cont)

No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
10	Yes	The product is constructed to an acceptable standard of quality or the investigation is carried out in a sufficiently detailed manner.	Yes	Yes	Yes	The product is constructed to a high standard and functions correctly or the investigation is carried out in a comprehensive manner.
11	Yes	Tests are carried out in a technically proficient way or sufficient checks are made on the investigation data to ensure reasonable confidence in the reliability and accuracy of the data.	Yes	Yes	Yes	All tests on the product are conducted in a technically correct way with due account being taken of inaccuracies introduced by the measurement processes or comprehensive checks are made on investigation data to ensure full confidence in the reliability and accuracy data.
12	Yes	The interpretation of test results or investigation data is correct.	Yes	Yes	Yes	The interpretation of test results or investigation data is accurate and the analysis of the results or data is used to identify improvements in product performance or the Outcomes of the investigation.
13	Yes	The log book contains a complex level of detail about project ideas and progress and there is evidence that entries have been made on at least six occasions during the life of the project.	Yes	Yes	Yes	The log book is regularly maintained and provides a detailed, informal record of the candidate's thinking as the project develops including reflective comments.

Grading Checklist (cont)

No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
14	Yes	The project report meets acceptable standards in terms of structure, use of English and clarity, and has accurate conclusions and recommendations. **Double Weight**	Yes	Yes	Yes	The project report is well structured, contains only relevant information, has clear and accurate conclusions and recommendations and uses clear and concise English. **Double Weight**
15	Yes	The project includes an evaluation of the project strategy and activities and includes an evaluation of what the candidate has learned from undertaking the project.	Yes	Yes	Yes	The project report includes a complex and comprehensive evaluation of the project strategy and activities and includes a clear evaluation of what the candidate has learnt from undertaking the project and the factors involved.
16	Yes	The presentation is acceptably structured, contains largely relevant information and is to time. **Double Weight**	Yes	Yes	Yes	The presentation is well structured, contains only relevant information, is to time and includes the use of appropriate aids. **Double Weight**
17	Yes	The candidate gives technically correct answers to questions raised as part of the presentation.	Yes	Yes	Yes	The candidate gives clear, concise and technically accurate answers to questions raised during the presentation.
18	Yes	The candidate includes a reflective account of the success, or otherwise, of the project in the presentation.	Yes	Yes	Yes	The candidate includes a complex, reflective account of the success, or otherwise, of project activities against project objectives in the presentation.

Grading Checklist (cont)

No.	No Grade	Grade C Criteria	Grade C	Grade B	Grade A	Grade A Criteria
19	Yes	The candidate undertakes the project without unnecessary interventions from the project supervisor to ensure the project remains on track.	Yes	Yes	Yes	The candidate undertakes the project with the minimum of supervision.
20	Yes	The candidate provides at least three examples of new knowledge and skills she/he has developed as a result of completing the project.	Yes	Yes	Yes	The candidate identifies clear and full details of the new knowledge and skills she/he has developed as a result of doing the project such as project management skills, investigation/research skills, keeping to deadlines, recognising limitations of knowledge — approaching expert sources.
21	Yes	None	Yes	Yes	Yes	The candidate introduces a significant novel feature into the project.
22	Yes	The candidate demonstrates an acceptable level of motivation throughout the project.	Yes	Yes	Yes	The candidate demonstrates a high-level of self-motivation throughout the project.
23	Yes	None	Yes	Yes	Yes	The candidate undertakes additional research well beyond that demanded by the project.

Guidance on the Completion of the Grading Checklist

Centre staff are asked to read the following guidance notes before completing the Grading Checklist.

The checklist had been designed to help assessor(s) decide what Grade should be awarded to a candidate completing the Aircraft Engineering Project. It will also be used by external verifiers as part of the external verification of project work.

A Grading Checklist form should be completed for each candidate who has been entered for the Aircraft Engineering: Graded Unit 2 (Aircraft Engineering Project)

In completing the checklist, assessors should take note of the following points.

1 For each item shown in the checklist, the Yes should be circled which most closely reflects the candidate's performance. It can be seen from the checklist that grade criteria for Grade C and Grade A passes have been included in the checklist and items 14 and 16 are double weighted.

2 A Grade B should be awarded where a candidate's performance lies approximately mid-way between a Grade C and a Grade A (ie better than a Grade C (Competent) but not good enough to be a Grade A (Highly Competent).

3 No grade should be awarded where a candidate's performance is not good enough to satisfy a Grade C Pass (ie a competent level of performance).

4 Once centre assessor(s) have completed the twenty three items, they should then apply their own professional judgement to decide what Grade to award the candidate.

5 In arriving at the grade, due account should be taken of the distribution circles around 'Yes'. For example, if 19 out of the 24 items have been circled 'Yes' under the Grade B column and the other 5 have been circled under the Grade C column, then it is likely that the assessor(s) will award the candidate a Grade B. Professional judgement is much more involved where, for example, if 'Yes' is circled 12 times under the Grade A column and 12 times under the Grade B column. The assessor's first hand knowledge of the candidate's performance will influence whether the candidate is awarded Grade A or Grade B. External verifiers are unlikely to overturn the grading awarded by the Centre assessor(s) unless they are not happy that grading judgements have been awarded in a fair, consistent and rigorous manner.

Centres may provide additional comments and/or evidence in support of their grading decisions.

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Evidence Requirements

The project consists of three stages: planning; developing; and evaluating. The following table specifies the minimum evidence required to pass each stage.

Note: The candidate must achieve **all of the minimum evidence** specified below for each stage of the project in order to pass the Graded Unit.

Project Stage	Minimum Evidence Requirements
Stage 1 — Planning	♦ A project brief identifying customer requirements ♦ A project specification that the customer has agreed ♦ A set of project objectives ♦ A project schedule ♦ Information about the different solutions ♦ Justification of the chosen solution ♦ Verification strategy ♦ Maintenance of a log book ♦ Complies with Health and Safety procedures *The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage.*
Stage 2 — Developing	♦ Practical output from the project (design, analysis, installation, investigation etc) ♦ Records of progress underpinning the project such as: — Log book — Progress reports ♦ Test results or investigation findings as part of the verification strategy ♦ Complies with Health and Safety procedures *The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage.*

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Project Stage	Minimum Evidence Requirements
Stage 3 — Evaluating	♦ Review of project specification as the project progresses ♦ Review of project schedule as the project progresses ♦ Analysis used to decide project option ♦ Progress reporting and goal setting as part of project implementation ♦ Actions taken to overcome unforeseen circumstances ♦ Interpretation of test results or investigation findings ♦ Action taken as a result of test results or investigation findings interpretation ♦ An assessment of the strengths and weaknesses of the practical output of the project ♦ An evaluation of the extent to which the project brief and objectives have been overtaken ♦ Reflective part of the presentation ♦ Indication of any knowledge and skills which have been gained by the candidate ♦ Complies with Health and Safety procedures *The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage.*

Support Notes

In addition to the assessment, this Graded Unit may also contribute towards the component 'Planning and Organising' of the Core Skill Problem Solving at SCQF level 6. Candidates may have to develop a plan for their own research when completing this Graded Unit. The general Core Skill that candidates may have to complete is 'Plan and Organise a complex task'.

In completing this Graded Unit candidates have the opportunity to develop the Core Skill Working with Others at SCQF level 6. Candidates may have the opportunity to work within a group, co-operate and contribute to group decisions regarding their chosen project. The general Core Skill that candidates may have an opportunity to complete is Working with Others in a group to 'Analyse, plan and complete a complex activity'.

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative assessment arrangements. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: **www.sqa.org.uk**.