QUALIFICATION HANDBOOK

Level 2 Certificate in Aircraft Maintenance (Military Aircraft) (2675-01)

September 2017 Version 1.1

City & Guilds

Qualification at a glance

Subject area	**Aeronautical Engineering**
City & Guilds number	2675
Age group approved	16-18, 19+
Entry requirements	City & Guilds does not set a minimum requirement for entry to this qualification. The apprenticeship framework **suggests** the following: Employers would be interested in candidates that: • Are keen and motivated to work in an engineering environment • Are willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace • Have previous work experience or employment in the sector • Have completed a 14 to 19 Diploma in Engineering or Manufacturing • Have completed a Young Apprenticeship in Engineering or other related area • Have GCSEs in English, Maths and Science • Have completed tests in basic numeracy, literacy and communication skills and have spatial awareness As a guide, the Engineering Manufacturing framework is suitable for applicants who have five GCSEs grades D to E in English, Maths and Science.
Assessment	Assignment, Multiple Choice test
Fast track	Available
Support materials	Centre handbook
Registration and certification	Consult the City & Guilds website for information

Title and level	GLH	TQT	City & Guilds number	Accreditation number
Level 2 Certificate in Aircraft Maintenance (Military Aircraft)	180	220	2675-01	600/1969/4

Version and date	Change detail	Section
1.1 September 2017	Added TQT details Deleted QCF	**Qualification at a glance and Structure** **Throughout**

Contents

1 Introduction

This document tells you what you need to do to deliver the qualification.

Area	Description
Who is the qualification for?	For candidates who work or want to work in the aeronautical engineering sector across a range of roles and career routes.
What does the qualification cover?	Allows candidates to learn, develop and practise the skills required for employment and/or career progression in the aeronautical engineering sector.
Is the qualification part of a framework or initiative?	This qualification is recognised as a technical certificate in the Engineering Manufacture apprenticeship framework.
What opportunities for progression are there?	Further opportunities for candidates include: • Level 2 NVQ Diploma in Aeronautical Engineering (City & Guilds 1789) • Level 3 Diploma in Aircraft Engineering (City & Guilds 2675) • Level 3 Certificate/Diploma in Aircraft Manufacturing (City & Guilds 4597) • Level 3 Diploma in Survival Equipment (City & Guilds 5412)

Structure

Learners require a total of **22 credits** to achieve the **Level 2 Certificate in Aircraft Maintenance (Military Aircraft)**. Learners must achieve 17 credits from the Mandatory Units and a minimum of 5 credits from the Optional Units. Learners can undertake elective unit 111, however any credit achieved cannot be used towards the required minimum of 22 credits.

Mandatory Units

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
M/503/1263	Unit 035	Human factors in aviation	5
L/503/0928	Unit 104	Fundamentals of military aircraft maintenance practices and policy	4
R/503/0929	Unit 105	Fundamentals of military aircraft documentation	3
L/503/0931	Unit 106	Flight line maintenance of military aircraft	5

Optional Units

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
R/503/0932	Unit 109	Fundamentals of military aircraft construction	5
J/503/0944	Unit 110	Fundamentals of airframe structural inspection and husbandry	5

Elective Unit

Unit accreditation number	City & Guilds unit number	Unit title	Credit value
D/503/0951	Unit 111	Working safely with aircraft armament systems	5

Total Qualification Time

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 2 Certificate in Aircraft Maintenance (Military Aircraft)	180	220

2 Centre requirements

Approval

For Level 2, centres already delivering the Level 2 City & Guilds Certificate in Aeronautical Engineering (2597) will be automatically approved to run the Level 2 routes in this qualification.

For Level 3, centres already delivering the City & Guilds Certificate in aeronautical Engineering (2661) will be automatically approved to run this new qualification at both levels 2 and 3.

To offer this qualification, new centres will need to gain both centre and qualification approval. Please refer to the *Centre Manual - Supporting Customer Excellence* for further information.

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Resource requirements

Physical resources and site agreements

Centres can use specially designated areas within a centre to assess, for example, the installation of specialised electrical systems, alignment and setting up of electric motors and driven devices (pumps, compressors, and generators). The equipment, systems and machinery must meet industrial standards and be capable of being used under normal working conditions, for example electric motors must have a method of applying sufficient power and not be connected up to show movement.

Please note that to gather the requisite evidence, access to flight worthy aircraft is required on a regular basis.

Centre staffing

Centre staff must satisfy the requirements for occupational expertise for this qualification.

These requirements are as follows:

Staff should be technically competent in the areas for which they are delivering training and/ or should also have experience of providing training.

Staff delivering these qualifications must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the area for which they are delivering training and/or have experience of providing training. This knowledge must be to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Assessors and internal verifiers

While the Assessor/Verifier (A/V) units are valued as qualifications for centre staff, they are not currently a requirement for the qualification.

Continuing professional development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification

Verifier Requirements (internal and external)

Internal quality assurance (Internal Verification) must be carried out by competent Verifiers that as a minimum must hold the Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practices. Current and operational Internal Verifiers that hold internal verification units V1 or D34 will not be required to achieve the Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the Level 3 Award in Assessing Competence in the Work Environment.

External quality assurance **(External Verification)** must be carried out by competent External Verifiers that as a minimum must hold the Level 4 Award in the External Quality Assurance of Assessment Processes and Practices**.** Current and operational External Verifiers that hold external verification units V2 or D35 will not be required to achieve the Level 4 Award as they are still appropriate for the verification requirements set out in this Unit Assessment Strategy. Verifiers must be familiar with, and preferably hold, either the nationally recognised Assessor units D32 and/or D33 or A1 and/or A2 or the Level 3 Award in Assessing Competence in the Work Environment

External and Internal Verifiers will be expected to regularly review their skills, knowledge and understanding and where applicable undertake continuing professional development to ensure that they are carrying out workplace Quality Assurance (verification) of Assessment Processes and Practices to the most up to date National Occupational Standards (NOS) Verifiers, both Internal and External, will also be expected to be fully conversant with the terminology used in the NVQ units against which the assessments and verification are to be carried out, the appropriate Regulatory Body's systems and procedures and the relevant Awarding Organisation's documentation.

Candidate entry requirements

City & Guilds does not set entry requirements for this qualification. However, centres must ensure that candidates have the potential and opportunity to gain the qualification successfully so should have the opportunity to gather work based evidence.

The SEMTA Engineering Manufacture apprenticeship framework suggests that:

Employers would be interested in candidates that:

- Are keen and motivated to work in an engineering environment
- Are willing to undertake a course of training both on-the-job and off-the-job and apply this learning in the workplace
- Have previous work experience or employment in the sector
- Have completed a 14 to 19 Diploma in Engineering or Manufacturing
- Have completed a Young Apprenticeship in Engineering or other related area
- Have GCSEs in English, Maths and Science
- Have completed tests in basic numeracy, literacy and communication skills and have spatial awareness.

As a guide, the Engineering Manufacturing framework is suitable for applicants who have five GCSEs grades D to E in English, Maths and Science. The selection process on behalf of employers may include initial assessment where applicants will be asked if they have any qualifications or experience that can be accredited against the requirements of the apprenticeship. They may also be required to take tests in basic numeracy and literacy, communications skills and spatial awareness. There may also be an interview to ensure applicants have selected the right occupational sector and are motivated to become an apprentice, as undertaking an apprenticeship is a major commitment for both the individual and the employer.

Recognition of prior learning

Without evidence of formal qualifications, candidates must demonstrate adequate prior knowledge and experience to ensure they have the potential to gain the qualification. It is recognised that learners come from a wealth of applicable backgrounds and in these cases it is recommended that the centre assess learner competence against their claims.

Age restrictions

There is no age restriction for this qualification unless this is a legal requirement of the process or the environment.

3 Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs,
- support and guidance they may need when working towards their qualification.
- any units they have already completed, or credit they have accumulated which is relevant to the qualification.
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the candidate fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Support materials

The following resources are available for these qualifications:

Description	How to access
Centre devised forms	**www.cityandguilds.com**, 2675 qualification pages
Centre devised generic guidance: • Centre guidance • Generic grading criteria	**www.cityandguilds.com**, 2675 qualification pages
Guidance for producing centre devised tasks (specific guidance for each unit within a pathway)	**www.cityandguilds.com**, 2675 qualification pages
Example assignments (for selected units only)	**www.cityandguilds.com**, 2675 qualification pages

4 Assessment

Assessment of the qualification

This qualification is assessed by a combination of e-assessments (multiple choice tests) and centre devised assignments covering practical skills and underpinning knowledge. The table below provides details on the assessment methods for each unit.

Mandatory Units

City & Guilds unit	Unit title	Assessment method
2675-035	Human factors in aviation	e-assessment
2675-104	Fundamentals of military aircraft maintenance practices and policy	Centre Devised Assignment
2675-105	Fundamentals of military aircraft documentation	Centre Devised Assignment
2675-106	Flight line maintenance of military aircraft	Centre Devised Assignment

Optional Units

City & Guilds unit	Unit title	Assessment method
2675-109	Fundamentals of military aircraft construction	Centre Devised Assignment
2675-110	Fundamentals of airframe structural inspection and husbandry	Centre Devised Assignment

Elective Unit

City & Guilds unit	Unit title	Assessment method
2675-111	Working safely with aircraft armament systems	Centre Devised Assignment

Online multiple-choice assessments

The online multiple-choice assessments for this qualification will be in the form of a question with three options to choose from (a, b, c) and calculators are **not** permitted. This is to bring it in line with the CAA exams and the expectation from industry that candidates can do basic mathematics (including long division) without a calculator. Please refer to the 2675-001 sample questions to understand the level of maths required of candidates – this will be available to download from the City & Guilds website.

Centre set assignments

Centres must refer to '*Developing assignments – guidance for centres*' and the associated assignment development forms which are available to download from **www.cityandguilds.com**.

Example assignments and specific assessment guidance for each unit is also available for this qualification and can be found on **http://www.cityandguilds.com**.

Approval process for centre set assignments

Centre set assignments must be approved by the external verifier before use. For each assignment, the *assignment sign off sheet* (AD3) must be completed and be made available to the EV for inspection.

Time constraints

Timings for e-assessments are indicated in the test specifications on page 12.

The centre set and marked assignments will need to have some limits to the time available. The time available may be based on practicalities such as scheduling marking during the required period, but the time available must always be sufficient for candidates to tackle the task fairly, and candidates will be able to negotiate extra time in appropriate circumstances.

Test specifications

The way the knowledge is covered by each online test is laid out in the tables below:

Test 1: Unit 035 Human Factors in Aviation
Duration: 60 minutes

Outcome	Number of questions	%
01 Understand why human factors are important in aviation	2	5
02 Know features of human performance	6	15
03 Know aspects of social psychology	6	15
04 Know personal factors that affect human performance	6	15
05 Know physical aspects of working environments that affect human performance	5	12.5
06 Know categories of task that can affect human performance	5	12.5
07 Understand communication in the workplace	3	7.5
08 Understand how human error occurs	3	7.5
09 Know hazards and risks in aeronautical engineering environments	4	10
Total	**40**	**100**

5 Units

Availability of units

Below is a list of the learning outcomes for all the units. If you want to download a complete set of units, go to **www.cityandguilds.com**

Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- unit aim
- relationship to NOS, other qualifications and frameworks
- endorsement by a sector or other appropriate body
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance

Unit 035 Human factors in aviation

Level: **3**

Credit value: **5**

UAN: **M/503/1263**

Unit aim

The aim of this unit is to give the learner a comprehensive knowledge of human factors within the aircraft industry to assist them in living and working safely. It is a mandatory subject within the industry. The unit covers the complete syllabus of EASA Module 9 for Category B 1 and B2 licences.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will:

1. understand why human factors are important in aviation
2. understand features and limitations of human performance
3. understand aspects of social psychology
4. understand personal factors that affect human performance
5. understand how physical aspects of the working environment affect human performance
6. understand how categories of tasks can affect human performance
7. understand communication in the workplace
8. understand the causes of human error
9. understand the human factors aspects of aircraft incidents
10. understand risk assessments in aeronautical engineering environments.

Guided learning hours

It is recommended that **40** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the Aeronautical Engineering Level 2 NOS Unit 001 and Level 3 NOS Unit 003.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA.

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Communication
- Improving Own Learning and Performance
- Problem Solving
- Working with Others

Assessment and grading

This unit will be assessed by:

- An online multiple-choice test.

Unit 035 Human factors in aviation

Outcome 1 Understand why human factors are important in aviation

Assessment Criteria

The learner can:

1. explain the term 'Human Factors'
2. explain why Human Factors are important in the aeronautical engineering workplace
3. explain categories of Human Factor that are important to aeronautical engineering staff.

Range/Scope/Unit content

List 1

Meaning of the term and how it is used in aviation
SHEL Model, 'Murphy's Law', anthropometry

List 2

Eg:
Safety of employees, passengers, people on the ground etc
Safety of assets (eg: aircraft, equipment etc)
Long-term health of employees
Efficiency of the organisation

List 3

Eg:
Working environment
Work patterns
Social habits
Work load
Communication
Employee health.

Unit 035 Human factors in aviation

Outcome 2 Understand features and limitations of human performance

Assessment Criteria

The learner can:

1. explain how images are seen and interpreted by humans
2. explain how sounds are heard and interpreted by humans
3. explain limitations of human memory
4. describe factors that affect mental attention span
5. describe how variations in an individual's sight and hearing can affect their behaviour
6. explain how working in challenging environments presents risks to airworthiness.

Range/Scope/Unit content

List 1

To include:

Main parts of the eye

How each part of the eye reacts to light

Rods and cones

Seeing in high and low light

Peripheral vision

Interpretation by the brain

List 2:

To include:

Main parts of the ear

Vulnerable parts of the ear

Effect of noise – percussive, prolonged high intensity, varying pitch

Noise Induced Hearing Loss (NIHL)

Legal requirements for hearing protection

Correct protection for frequency range

List 3

Simple explanation eg:

Time from exposure to information

Form that information is in (audio, visual, words, pictures etc.)

Fatigue

Age

Complexity of information

Artificial stimulants/depressants

Types (iconic, echoic, episodic, symantic)

List 4

Eg:
Overconfidence
Boredom
Fatigue
Complexity of information
Artificial stimulants/depressants

List 5

Individually and in combination (such as in older people)
Sight eg:

- Long and short sight
- Optical illusion including the strobe effect
- Persistence
- Moving from light area to work in the dark
- Optimum lighting for typical tasks
- Long and short sight
- Use of spectacles and magnifiers

Hearing eg:

- High and low tone deafness
- Tinnitus
- Hearing damage, poor communication

Social isolation (at work and at home)

List 6

At height and in confined spaces eg:

- Claustrophobia
- Fear of heights
- Limited access/egress to a large space
- Confined space

Specific tasks (eg: inspections on fuselage crown or in equipment bays)
Low concentration
Rushing the task
Cutting corners
Poor vision.

Unit 035 Human factors in aviation

Outcome 3 Understand aspects of social psychology

Assessment Criteria

The learner can:

1. explain areas of individual and group responsibility in aircraft engineering environments
2. explain motivation and de-motivation
3. explain 'peer pressure'
4. explain company culture
5. explain the concepts of team working
6. identify the primary responsibilities of engineering managers and supervisors
7. discuss the basic concept of leadership.

Range/Scope/Unit content

List 1

Outline of a typical organisation (must include maintenance)

Typical roles and responsibilities

Individuals and groups or teams

Individual responsibility when working alone and within a team

Group or team responsibilities

Overview of group and inter-group dynamics (eg: rivalry, polarisation, 'social loafing')

List 2

Overview of:

- Fulfilling individual needs
- Maslow's Hierarchy of Needs
- Individual motivation
- Motivation by management
- Characteristics of motivation and de-motivation

How they can be affected by internal and external factors eg:

Management decisions

Personal situation

List 3

Eg:

Conformity and non-conformity

Pressure from co-workers, not management

Advice and pressure from more experienced colleagues to adopt particular work practices

How it can affect performance of maintenance tasks

List 4

Overview of different types of culture (eg: safety, organisational, shift, team, social etc.)

More detailed knowledge of safety culture and the individual

How company culture can compromise best working practices

List 5

What is a team?

Advantages and disadvantages of team working

Team identity

Working with other teams

Ownership of tasks

Communication

Co-operation

Mutual support

List 6

Difference between management and supervisor roles

What should an employee expect from a supervisor? (eg motivation, support, guidance etc.)

Engineering organisations (eg:part145, military maintenance organisation)

List 7

What is a leader?

The basic characteristics of a leader.

How and when any individual might provide leadership eg:

- Passing on knowledge and experience to colleagues
- Organising and directing group tasks
- Inspection and reporting on the work of others.

Unit 035 Human factors in aviation

Outcome 4 Understand personal factors that affect human performance

Assessment Criteria

The learner can:

1. explain effects of personal health and fitness on work performance
2. identify types of stress
3. explain effects of setting time deadlines on individual work performance
4. explain the concept of work overload and underload
5. explain the effects of shift work on sleep and fatigue
6. explain the effects of alcohol, medication and substance abuse
7. explain the personal legal obligations of individuals in the aviation industry.

Range/Scope/Unit content

List 1

Legal requirement for individual physical and mental fitness while at work

Types of medical condition that might affect work eg:

- Minor illness (eg: cold, 'flu, sickness)
- Major physical illness (eg: heart attack, stroke, cancer)
- Mental illness (eg: depression)
- Minor physical injury (eg: sprained wrist, pulled muscle, cramp)
- Major physical injury (eg: broken bones, lacerations)
- Effects of toxins and other substances (eg: carbon monoxide, alcohol, drugs)
- Gradual deterioration in physical condition

List 2

Define 'stress' (eustress, distress, acute stress, chronic stress, hypo stress, hyper stress)

Sources:

- Home (eg: family illness, divorce)
- Work (organisational, task related)

Types:

- Acute and chronic stress
- Signs of stress (physical, health, behaviour, cognitive, other)

Explain how stress can affect individual performance at work

List 3

Actual, perceived and self-imposed deadlines

Effects of time pressure and deadlines

Managing time pressure and deadlines

List 4
Definition of work overload and underload
Results of work overload and underload
Factors determining workload
Workload management

List 5
What is sleep?
Five stages of sleep
Circadian rhythms
Fatigue (causes, symptoms)
Advantages and disadvantages of shift work
Working at night
Types of shift pattern

List 6
Effects of alcohol
Removal of alcohol from the blood
Effects while fatigued, hungry or combined with medication
Types, effects, short and long term consequences of abuse of:

- Alcohol
- Prescription medication
- Over-the-counter medication
- Illegal drugs

Effects on individual work performance

List 7
Eg:
Alcohol limits and legal requirements for aircraft engineers
CAP 562/AN47
Transport legislation/AN45
Health and Safety legislation.

Unit 035 Human factors in aviation

Outcome 5 Understand how physical aspects of the working environment affect human performance

Assessment Criteria

The learner can:

1. explain effects of noise on individuals and groups
2. explain effects of fumes on individual performance
3. explain effects of varying illumination on an individual performance
4. explain effects of variations in climate on an individual performance
5. explain effects of exposure to constant motion and vibration while working
6. explain effects of layout of a working environment on individual performance.

Range/Scope/Unit content

List 1

Eg effects on:

Concentration

Communication

List 2

Eg effects on:

Concentration

Communication

Longer term effects

Safe oxygen levels

List 3

Eg:

Ability to see detail

Moving between areas of different illumination, including well-lit hangar and night flight line

Strobe effect and propellers

List 4

Eg:

Cold/wet, warm/dry, hot/humid environments

List 5

Eg:

Working at height on scissor platforms and cherry picker

Unsteady platforms

Use of rotating or percussive tools

Vibration White Finger (VWF)

List 6
Eg:
The three components of a working environment
Layout
Cleanliness
Ease of movement between work areas
Lighting, noise, atmosphere, temperature etc
Social environment
Tasks, tools and information.

Unit 035 Human factors in aviation

Outcome 6 Understand how categories of tasks can affect human performance

Assessment Criteria

The learner can:

1. explain the importance of planning the execution of a task
2. explain effects of physically demanding work on individual performance
3. explain effects of repetitive tasks on individual performance
4. explain aspects of visual inspection
5. explain aspects of working on complex systems.

Range/Scope/Unit content

List 1

Eg:
Defining the task
Defining the resources
Personal skills and proficiency
Information

List 2

Eg:
Health and physical condition, effects of ageing
Work environment
Physical effort
Effects of ageing

List 3

Eg:
Ignoring manuals, job cards etc.
Complacency
Making assumptions

List 4

Eg:
Importance of good eyesight
Knowledge of the inspection area
Illumination
Concentration
Systematic search

List 5

Eg:
Simple system: transparent to the engineer
Complex system: opaque to the engineer
Clear understanding of the purpose of the system
System-specific training
Pooling of knowledge and skills
Clear and comprehensive information and guidance.

Unit 035 Human factors in aviation

Outcome 7 Understand communication in the workplace

Assessment Criteria

The learner can:

1. explain the importance of good communication in the workplace
2. explain the importance of accurate work logging
3. explain modes of communication between individuals and teams
4. explain the importance of maintaining individual professional currency
5. explain the importance of information dissemination.

Range/Scope/Unit content

List 1

Within and between groups eg:
Prevention of accidents
Maintaining good working relations
Organisational efficiency

List 2

Eg:
Formal work logging
Shift logging
Shift handover
Task staging
Duplicate
Inspection
Stage sheets/check

List 3

Eg:
Verbal
Written
Body language
Workplace social culture
Communication between all levels of an organisation

List 4

Eg:
Refresher training
Reading briefing material
Notices and amendments to maintenance procedures
Reading professional journals
Undertaking up-skilling and further licence training.

Unit 035 Human factors in aviation

Outcome 8 Understand the causes of human error

Assessment Criteria

The learner can:

1. explain the error models and theories used in aeronautical engineering
2. explain types of error that occur during work on aircraft
3. describe the error-incident-accident chain
4. describe methods of managing and avoiding errors.

Range/Scope/Unit content

List 1

Eg
Induced
Variable
Reversible/irreversible
Slips, lapses and mistakes
The 'Swiss Cheese Model'

List 2

Eg:
Complacency
Environmental capture
Rule-based errors
Violations
Individual practices and habits
Errors associated with visual inspection
Latent/active errors

List 3

Eg:
Self discipline
Safety Management System
Anonymous and blame-free reporting
Training
Logging and analysis.

Unit 035 Human factors in aviation

Outcome 9 Understand the human factors aspects of aircraft incidents

Assessment Criteria

The learner can:

1. analyse an incident report to extract information
2. identify a sequence of events from a narrative report
3. identify human factors contributing to an incident
4. draw conclusions from incident data.

Range/Scope/Unit content

List 1

Using extracts from an actual report or a realistic example

Filter out irrelevant detail

List 2

How, why, when where, who

Use presentation aids such as flow diagrams

Identify what should have been done

List 3

Analyse the information and identify contributing factors

- Including where possible:
- Personal behaviour
- Environmental conditions
- Management
- Organisational culture

Using eg:

- MEDA
- MEMS

List 4

Including where necessary, brief details of:

Environment

Personal issues

Organisation

Nature and mix of allocated tasks

Recommendations for preventative action.

Unit 035 Human factors in aviation

Outcome 10 Understand risk assessments in aeronautical engineering environments

Assessment Criteria

The learner can:

1. define the terms associated with risk assessment
2. describe the five steps to risk assessment
3. describe the associated risks for workplace hazards
4. describe conclusions from risk assessments
5. explain how to manage workplace emergencies.

Range/Scope/Unit content

List 1

Hazard

Risk

Severity

Likelihood (probability)

List 2

1 - Identify hazards

2 - Decide who might be harmed and how

3 - Evaluate risks and decide on precautions

4 - Record findings and implement them

5 - Review and update

List 3

Step 2

List 4

Steps 2&3

Recommend ways of eliminating or reducing to an acceptable level, a range of identified risks

List 5

Steps 3&4 eg:

Reduce the likelihood of them happening

Management of workplace emergency situations such as fire, spillage, personal injury etc.

Unit 035 Human factors in aviation

Notes for guidance

The teaching of the knowledge content of this unit should be referenced to the Civil Aviation Authority (CAA) publication CAP715 or its military equivalents. The City & Guilds GOLA examination is based on the content of CAP 715.

This unit contains the complete syllabus of EASA 2042/2003 part 66 Basic Knowledge Requirements Module 9 – Human Factors. The equivalent EASA knowledge level indicators for each of the above outcomes are listed below with an abridged description of each level:

Level 1 – "A familiarisation with the principal elements of the subject"

Level 2 – "A general knowledge of the theoretical and practical aspects of the subject"

Level 3 – "A detailed knowledge of the theoretical and practical aspects of the subject"

Outcome 1: EASA Level 2
Outcome 2: EASA Level 2
Outcome 3: EASA Level 1
Outcome 4: EASA Level 2
Outcome 5: EASA Level 1
Outcome 6: EASA Level 1
Outcome 7: EASA Level 2
Outcome 8: EASA Level 2
Outcome 9: EASA Level 2
Outcome 10: EASA Level 2

Note: the above list equates to the EASA requirement for category B licences and is for guidance only. It is primarily for those learners wishing to sit the CAA examination in this subject.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Level: 2

Credit value: 4

UAN: L/503/0928

Unit aim

To provide learners with a detailed understanding of military aircraft maintenance practices and policies.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will:

1. understand maintenance procedures
2. understand the requirements of environmental protection and health and safety legislation
3. understand the purpose of quality management systems
4. understand the need for the prevention of Foreign Object Damage (FOD)
5. understand responsibilities of individuals for Flight Safety
6. understand about aircraft Health and Usage Monitoring Systems (HUMS)
7. understand fire safety precautions
8. understand safety precautions for corrosive fluids
9. understand hangar and workshop safety precautions
10. understand tool control methods.

Guided learning hours

It is recommended that **35** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the Aeronautical Engineering Level 2 NOS Units 001, 003.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Communication
- Improving Own Learning and Performance

Assessment and grading

This unit will be assessed by:

- centre-set written tests covering knowledge and understanding.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 1 Understand maintenance procedures

Assessment Criteria

The learner can:

1. explain the structure of maintenance lines
2. explain preventative and corrective maintenance
3. explain non-routine maintenance procedures.

Range/Scope/Unit content

List 1

Define the term maintenance

Explain the depths of aircraft maintenance:

1st, 2nd, 3rd and 4th line

Forward, depth and deployable depth support

List 2

Explanation of maintenance cycles:

Flight, Primary, Flexible Primary, Minor and Major maintenance

Scheduled, corrective and preventative maintenance

List 3

Out-of-phase servicing

Servicing Instructions

Special technical Instructions

Urgent Technical Instructions

Routine Technical Instructions

Modifications

Special Trial Fits

Aviation Local Technical Instructions.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 2 Understand the requirements of environmental protection and health and safety legislation

Assessment Criteria

The learner can:

1. explain requirements of environmental legislation
2. explain requirements of health and safety legislation.

Range/Scope/Unit content

List 1

As applicable to military engineering environments

Include:

- Define Environmental impact
- Purpose and responsibilities of individuals
- Chain of command
- Identify Hazards associated with Spillages and pollution
- Actions to prevent Spillages and pollution
- Action in event of Spillages and pollution
- Procedures for dealing with Typical Dangerous Engineering Substances (DES)

List 2

The Health and Safety at Work etc. Act 1974 (HASWA) and its Regulations:

The responsibilities of Employers and Employees

Chain of Command

Implementation of HASAW on Military Units: Safety Policy Statement, Station H&S Organisation

Responsibilities of individuals dealing with Control of Substances Hazardous to Health (COSHH)

Different types and correct use of PPE

Typical Dangerous Engineering Substances (DES)

Typical symbols and signs associated with DES

First Aid for typical DES

Action to be taken by individuals whenever Danger is perceived

Working at Height (WAH) Regulations: Definitions, responsibilities and Precautions

Safety Equipment associated with WAH: responsibilities of people concerned, correct usage.

Working in confined spaces.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 3 Understand the purpose of quality management systems

Assessment Criteria

The learner can:

1. explain the purpose of quality systems
2. describe operation of quality systems.

Range/Scope/Unit content

List 1

With particular reference to a military or associated organisation eg: RAF, MOD contractor

Need for a quality system

Aim of quality management systems

List 2

Within a military or associated organisation:

Typical responsibilities

Techniques and methods

Implications of quality failures

Corrective action

Quality audits.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 4 Understand the need for the prevention of Foreign Object Damage (FOD)

Assessment Criteria

The learner can:

1. explain causes of FOD
2. describe effects of FOD
3. describe methods to prevent FOD.

Range/Scope/Unit content

List 1

Include:
Definition
Typical causes

List 2

Effect on aircraft eg:
Damage to engines and airframes, expensive to repair and replace
Potential for personal injury/loss of life
Actions to be taken in event of aircraft compromised by FOD

List 3

Eg:
Responsibilities of individuals
Promotion of FOD prevention culture eg: Continuous Positive Attitude
Work and operational procedures that promote FOD prevention eg:
Tool control
Hangar and airfield inspections (eg: FOD walks, regular cleaning routines).

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 5 Understand responsibilities of individuals for flight safety

Assessment Criteria

The learner can:

1. explain the meaning of flight safety
2. explain individuals' responsibilities for maintaining flight safety.

Range/Scope/Unit content

List 1

Definition and aims of Flight Safety

The principle of a 'Just Culture'

List 2

Including:

- Responsibilities of individuals
- Actions to report Flight Safety accidents/incidents
- Personal attitude within a flight safety culture

Identify hazard warning symbols, flight safety posters, pamphlets and magazines

Identify typical hazards, associated regulations and methods of dealing with them eg:

- Helicopters
- Propellers
- Jet engine intakes
- Aircraft Assisted Escape Systems (AAES)
- Armed aircraft
- Radiation
- Fuel,
- High vapour areas
- FOD.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 6 Understand aircraft Health and Usage Monitoring Systems (HUMS)

Assessment Criteria

The learner can:

1. explain the need for a HUMS
2. describe the operation HUMS.

Range/Scope/Unit content

List 1

Definition of HUMS

Purpose

List 2

Basic system

Fatigue monitoring

Vibration control

Techniques for monitoring wear debris

Spectrometric Oil Analysis Programme (SOAP)

Magnetic chip detectors.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 7 Understand fire safety precautions

Assessment Criteria

The learner can:

1. describe sources of fire associated with aircraft
2. explain precautions to prevent and control fire.

Range/Scope/Unit content

List 1

Typical causes and possible locations of fire including:

Causes eg:

- Naked flames
- Static electricity
- Spark generators (eg: steel tools, metal-studded footwear)
- Substances eg:
- Flammable liquids
- Compressed gases especially gaseous and liquid oxygen
- Explosives and pyrotechnics
- Waste materials

Locations eg:

- Petroleum, Oils and Lubricants (POL) storage areas
- Explosive Storage areas
- High vapour areas (eg: solvent cleaning areas, battery charging rooms)
- Vicinity of spillages (eg: fuel leaks)
- LOX charging areas
- Refuelling points (eg: flight line, outside hangars)

List 2

Including:

Fire precautions (eg: prohibition of smoking, naked flame,)

Typical fire-safe working practices (eg: work procedures, workplace husbandry)

Actions to be taken in the event of a fire (eg: raise alarm, evacuation)

Methods of reporting a fire (eg: standard phone, emergency phone, radio.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 8 Understand safety precautions for corrosive fluids

Assessment Criteria

The learner can:

1. explain the term 'corrosive'
2. explain the dangers working with corrosive fluids
3. explain safety precautions for working with corrosive fluids.

Range/Scope/Unit content

List 1

Definition

Examples

List 2

Include:

Different types eg: acids, alkalis, mercury, cleaning and etching fluids

The requirements for use

Where they might to be found (eg: cargo, cleaning kits, repair kits)

Associated dangers (eg: mercury on aluminium, battery acid in contact with structure)

Procedures to be used when dealing with corrosive chemicals:

Individual's levels of responsibility

List 3

Safety precautions to be observed when dealing with corrosive chemicals:

- Detection
- PPE
- Ventilation
- Aircraft surface protection
- Disposal of waste products.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 9 Understand hangar and workshop safety precautions

Assessment Criteria

The learner can:

1. describe engineering hazards present in a hangar or workshop
2. describe hazards when working at height
3. explain the safe use of maintenance steps and access platforms
4. explain the safe use of inspection lamps and floodlights.

Range/Scope/Unit content

List 1

Include:

Prevention of explosive ignition
Noise hazards
Electrical hazards
Pressurized gases
Manual handling
Slips, trips and falls
Safety procedures
PPE

List 2

Responsibilities of individuals
Checking barriers and kick boards
Prevention of falling objects
Use and maintenance of safety harnesses
Fall arrest devices

List 3

Selection process
Typical maintenance platforms and ladders
Pre-use inspection
Safe-use procedures
Storage

List 4

Pre-use inspection
Power supplies and connection
Safety precautions associated with their use: eg usage limitations.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Outcome 10 Understand tool control methods

Assessment Criteria

The learner can:

1. explain the reasons for controlling the use of tools and equipment
2. explain tool control methods.

Range/Scope/Unit content

List 1

Dangers of FOD

List 2

Responsibilities and procedures
Tool stores, composite tool kits
Tool tally systems
Shadow boards
Continuous Positive Attitude.

Unit 104 Fundamentals of military aircraft maintenance practices and policy

Notes for guidance

This unit has been produced to meet military aviation training requirements.

On completion of this unit the learner will be able to show a comprehensive knowledge of the policies and procedures used in the maintenance of military aircraft.

Assessment will be designed to demonstrate underpinning knowledge and use of relevant documentation.

Unit 105 Fundamentals of military aircraft documentation

Level: 2

Credit value: 3

UAN: R/503/0929

Unit aim

To provide learners with a detailed understanding of Aircraft Documentation (Military)

Learning outcomes

There are **five** learning outcomes to this unit. The learner will:

1. understand the Air Publications (AP) system
2. understand documentation and quality control in aircraft maintenance
3. understand electronic data recording of maintenance activities
4. understand aircraft maintenance work recording documentation
5. be able to use aircraft maintenance work recording documentation.

Guided learning hours

It is recommended that **25** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the Level 2 Aeronautical Engineering Level 2 NOS Unit 002.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Application of Number
- Communication
- Information and Communication Technology
- Improving Own Learning and Performance
- Problem Solving
- Working with Others

Assessment and grading

This unit will be assessed by:

- an assignment covering practical skills and underpinning knowledge.

Unit 105 Fundamentals of military aircraft documentation

Outcome 1 Understand the Air Publications (AP) system

Assessment Criteria

The learner can:

1. explain the system of Air Publications for aircraft
2. describe information contained in Aircraft Topics 1 and 5A2
3. explain definitions and abbreviations contained in JAP100A-01 and Topic 5A2
4. describe systems for supplying aircraft spares and equipment
5. explain how to identify items of technical equipment from an Aircraft Topic 3.

Range/Scope/Unit content

List 1

The need for an Air Publications system
Layout of a typical AP
Maintenance information contained in eg:
JAP100A 01
AP Topic1 to 6 and 10
Amendment action and recording

List 2

Topic 1 and 5A2 (Safety and Servicing Notes) eg::
Typical written and graphical information
Structure
Information contained in the topic
Maintenance procedures

List 3

For JAP100A-01 and 5A2 (Safety and Servicing Notes):
Correct terminology
Glossary of terms
Define serviceable, unserviceable and undertake
Common definitions

List 4

Typical supply organisation
The basic function of a typical supply system
Typical procedures for obtaining spares, material and equipment
Information and process media (eg: paper, IT systems)

List 5

Explain by demonstration how to identify and extract information from the Topic 3.

Unit 105 Fundamentals of military aircraft documentation

Outcome 2 Understand documentation and quality control in aircraft maintenance

Assessment Criteria

The learner can:

1. explain the need for documentation to record aircraft maintenance tasks
2. explain the relative responsibilities in the maintenance organisational structure
3. explain the function and responsibilities of a producer (tradesperson).

Range/Scope/Unit content

List 1

Including:
Maintenance history
Life limited components
Recording who did the work
Need for legally binding declaration of actions taken by individuals

List 2

Legal implications of signatures
Levels of authority
Role of supervisor
Role of management

List 3

Working in accordance with eg: APs, Maintenance Procedures etc:
Trade practices
Quality of work
Loose article checks
Tool control
Documentation.

Unit 105 Fundamentals of military aircraft documentation

Outcome 3 Understand electronic data recording of maintenance activities

Assessment Criteria

The learner can:

1. explain electronic recording of aircraft maintenance data.

Range/Scope/Unit content

List 1

Requirement for electronic recording systems
Basic structure and operation of eg: LITS:
eg LITS terminology
eg LITS Business Procedures
Updating systems
Security (eg: usernames and passwords, protection of software and data
Data accuracy.

Unit 105 Fundamentals of military aircraft documentation

Outcome 4 Understand aircraft maintenance work recording documentation

Assessment Criteria

The learner can:

1. explain the form MOD F700C
2. explain the form MOD F707B
3. explain the actions required to place an aircraft unserviceable
4. explain the documentation required to record aircraft flight servicing.

Range/Scope/Unit content

List 1

Purpose
Aircraft MOD Form 700 sections

List 2

Purpose
Continuation sheets
Signature responsibilities
Levels of authority
Countersignature

List 3

Responsibilities
Legibility; pen, colour, writing
SNOW (Serial Number of Work)
Form MOD F707A
Authorisation to clear entries

List 4

Purpose
Responsibility
Flight servicing schedule
Form MOD F705.

Unit 105 Fundamentals of military aircraft documentation

Outcome 5 Be able to use aircraft maintenance work recording documentation

Assessment Criteria

The learner can:

1. use documentation to record maintenance activities
2. use documentation to record aircraft flight servicing.

Range/Scope/Unit content

List 1

Maintenance/repair/test schedules
Documentation eg: MOD F707A, F707B
Legibility; pen, colour, writing
SNOW (Serial Number of Work)
Work details
Personnel details
Equipment details
Open entries
Times
Over-signatures
Continuation sheets

List 2

Flight servicing schedule
Documentation eg: form MOD F705
Legibility; pen, colour, writing
SNOW (Serial Number of Work)
Work details
Personnel details
Equipment details
Open entries
Times
Over-signatures.

Unit 105 Fundamentals of military aircraft documentation

Notes for guidance

This unit aims to give the learner a comprehensive knowledge of military aircraft documentation from the point of view of a producer in an aircraft operational/maintenance environment. It is intended to allow the learner to study the documentation and systems and then to practice their use prior to a practical assessment in a realistic maintenance environment.

Unit 106 Flight line maintenance of military aircraft

Level: **2**
Credit value: **5**
UAN: **L/503/0931**

Unit aim

To provide learners with a detailed understanding of aircraft flight line maintenance and associated practical tasks

Learning outcomes

There are **nine** learning outcomes to this unit. The learner will:

1 know hydraulic oil replenishment
2 know brake system foot motor replenishment
3 know gas turbine engine and gearbox oil replenishment
4 know aircraft refuelling and defuelling
5 understand hydraulic accumulator re-charging
6 understand normal and emergency gaseous oxygen system recharging
7 know fitting and removal of a liquid oxygen (LOX) unit
8 understand the visual checking of aircraft tyres and tyre pressures
9 be able to carry out aircraft flight servicing procedures.

Guided learning hours

It is recommended that **40** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the SEMTA Aeronautical Engineering Level 2 NOS Unit 006.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Application of Number
- Communication
- Improving Own Learning and Performance
- Problem Solving
- Working with Others

Assessment and grading

This unit will be assessed by:

- an assignment covering practical skills and underpinning knowledge.

Unit 106 Flight line maintenance of military aircraft

Outcome 1 Know hydraulic oil replenishment

Assessment Criteria

The learner can:

1. state the need to control the use of replenishment equipment
2. describe pre-use checks preparations for replenishment equipment.

Range/Scope/Unit content

List 1

Eg: Risbridger replenishment guns:
Restriction to a single type of fluid
Fluid type
Identification tags
Contaminated fluid
Reporting action in suspected contamination incidents

List 2

Eg: Risbridger gun
Blanking caps
Cleanliness
Piston locking pins
Fitment to fluid container
Fluid quantity dispensed

Unit 106 Flight line maintenance of military aircraft

Outcome 2 Know brake system foot motor replenishment

Assessment Criteria

The learner can:

1. describe the replenishment of a brake system foot motor
2. state where information regarding replenishment of the system can be found.

Range/Scope/Unit content

List 1

Reason for and operation of system eg:
Braking efficiency and operation
Low pressure circuit to operate high pressure brakes
Small fluid capacity
Requirement for replenishment

List 2

Aircraft Topic 1
Fluid level checking
Fluid level indicators

Unit 106 Flight line maintenance of military aircraft

Outcome 3 Know gas turbine engine and gearbox oil replenishment

Assessment Criteria

The learner can:

1. state the purpose of the gas turbine engine and gearbox oil system and components
2. state where information of oil specification can be found
3. describe safety precautions necessary when using synthetic oils
4. describe methods of checking and replenishing oil levels
5. describe typical aircraft documentation for recording oil replenishment.

Range/Scope/Unit content

List 1

Lubrication and cooling
Adequate supply of oil
Oil tank
Wet sump and dry sump system
Oil filters
Minimum oil level

List 2

Air publication Topic 1
Aircraft F700
NATO symbol for replenishment point

List 3

Correct oil grade
Cleanliness
Blanking caps
Oil caps fitted correctly
Personal protection; barrier cream, gloves, goggles
Spillages

List 4

Minimum oil level
Sight glass, dipstick, contents indicator, drop stick
Time oil levels checked after shutdown
Aircraft topic 1 and Topic 12
COSHH
Risbridger Gun pre-use checks
Oil leaks

List 5
F737
Procedure for excess use of engine oil
Loss or gain in oil level
Reporting action

Unit 106 Flight line maintenance of military aircraft

Outcome 4 Know aircraft refuelling and defuelling

Assessment Criteria

The learner can:

1. state the requirements of gas turbine fuels
2. list types of fuels available
3. describe methods of refuelling/defuelling aircraft
4. describe safety precautions applied during refuelling/defuelling operations
5. describe aircraft fuel contents checks
6. describe the documentation process following refuelling/defuelling operations.

Range/Scope/Unit content

List 1

Ease of flow
First time engine start
Complete and stable combustion under all conditions
High calorific value
Non – corrosive
Minimum fire hazard
Lubrication
Purpose of Fuel System Icing Inhibitor (FSII)

List 2

100LL AVGAS – NATO No F 18
AVTUR FSII - NATO No F34
AVTAG FSII – NATO No F40

List 3

Open line/Gravity refuelling
Pressure refuelling
Gravity and pressure hose units
Fuel drain points
Aircraft Topic 1
NATO identification fuel and earth points
Fuel control panel

List 4
Correct grade of fuel
Fuel bowser water sediment check
Clean refuelling equipment
Earthing: aircraft and bowser in correct sequence
No naked flame, starting ground equipment
Sequence of filling aircraft tanks

List 5
Aircraft fuel contents gauges
Fuel quantity and weight
Specific gravity

List 6
F705 Fuel Certificate
Fuel discrepancies

Unit 106 Flight line maintenance of military aircraft

Outcome 5 Understand hydraulic accumulator re-charging

Assessment Criteria

The learner can:

1. explain actions prior to checking nitrogen pressure
2. explain the effect of adiabatic heating on the charging pressure
3. explain the process to recharge accumulator gas pressure on a typical aircraft.

Range/Scope/Unit content

List 1

Explain why hydraulic pressure must be dissipated prior to checking nitrogen pressure

Accumulator base pressure

Mark 6A inflation adapter

Pre use checks on Mark 6A adapter

Schrader valve type

Pre-use checks on Mark 6A adapter

Aircraft contents gauge

List 2

Heat build up in compressed gases

Thermal expansion of gas

Inaccurate reading of gas pressure

Gas charging trolley pre-use checks, correct operation

List 3

Mark 6A inflation adapter; pre-use checks, correct operation

Gas charging trolley, pre-use checks, correct operation

Purge hose

Slow charging to prevent thermal expansion.

Unit 106 Flight line maintenance of military aircraft

Outcome 6 Understand normal and emergency gaseous oxygen system recharging

Assessment Criteria

The learner can:

1 explain the safety precautions for using gaseous oxygen charging equipment
2 describe how to recognise oxygen charging points
3 explain the importance of using the correct gas when charging
4 describe types of oxygen charging equipment
5 explain the effect of adiabatic heating on charging pressure
6 explain the process of recharging a gaseous oxygen system.

Range/Scope/Unit content

List 1

No oil or grease
Cleanliness of equipment and connections
No naked flame
Contamination

List 2

How to recognise oxygen charging points
Eg:
Aircraft topic 1
Aircraft topic 5B 1
Aircraft Topic 5A2
NATO symbol

List 3

Eg:
Safety implications for aircraft occupants
Flight safety implications

List 4

EG:
Oxygen charging trolley
Hale Hamilton portable Oxygen Aircraft Charging Unit
Zwick trolley

List 5

Heat build up in compressed gases
Thermal expansion of gas
Inaccurate reading of gas pressure
Oxygen charging equipment; pre-use checks, correct operation

List 6

Purging supply hose
Sequence charging
Minimum supply bottle pressure
Aircraft contents gauge
Emergency Oxygen bottle contents gauge
Aircraft documentation
Closing and locking aircraft charging connections and panels

Unit 106 Flight line maintenance of military aircraft

Outcome 7 Know how to fit and remove a liquid oxygen (LOX) unit

Assessment Criteria

The learner can:

1 describe the properties of LOX
2 describe the hazards associated with LOX
3 describe the safety precautions when working with LOX
4 describe how to check content, remove and refit a LOX pack.

Range/Scope/Unit content

List 1

Pale blue, odourless, tasteless

99% pure oxygen

Boils at – 183˚C

Expands gas 840 times volume of liquid

Reacts violently with oil, grease and solvents

Cannot exist as liquid above -118°C irrespective of pressure – critical temperature

List 2

Fire hazard

Explosion hazard

Physiological effects; similar to burning or scalding

Embrittling effect

Pressure increase in enclosed vessels

Store in well ventilated areas

List 3

Including:

Safety assistant

Personal protective Equipment (PPE); rubber apron, leather gauntlets, safety visor, clean overalls, rubber soled boots

First Aid procedures

Spillages

Correct transport carriers for LOX units

List 4

NATO symbol

Typical aircraft electrical power

Contents gauge

LOX unit locking devices on typical aircraft

Electric connectors

Supply and vent connections

Aircraft Topic 1

Closing access panels.

Unit 106 Flight line maintenance of military aircraft

Outcome 8 Understand the visual checking of aircraft tyres and tyre pressures

Assessment Criteria

The learner can:

1 explain why aircraft tyres must be maintained at the correct pressure
2 describe the correct procedures for checking tyre pressures
3 explain visual checks required on aircraft wheel and tyre assemblies.

Range/Scope/Unit content

List 1

Purpose

Keep tyre wear and damage to minimum

Tyre pressures to be checked when tyres are cold

Air Publication Topics 1, 5 and Flight Maintenance Schedule

List 2

Valve cap

Tyre pressure gauge; ensure calibration in date

List 3

Tyre regions; crown, shoulder, sidewall, bead

Embedded objects

Cuts in rubber and cords

Bulges and blisters

Tyre creep

Skid damage

Scalding

Contamination

Ageing

Excess wear

Wheels; impact damage, cracks, corrosion, missing locking devices, leaking fusible plugs.

Unit 106 Flight line maintenance of military aircraft

Outcome 9 Be able to carry out aircraft flight servicing procedures

Assessment Criteria

The learner can:

1 prepare a Risbridger gun for use
2 carry out a hydraulic fluid replenishment
3 carry out replenishment of a brake system foot motor
4 carry out gas turbine engine and gearbox oil replenishment
5 carry out aircraft refuel/defuel operations
6 carry out hydraulic accumulator charging
7 charge gaseous oxygen systems
8 check content, remove and fit a LOX pack
9 carry out checks on wheel and tyre assemblies.

Range/Scope/Unit content

List 1

Carry out the pre-use checks eg:

Blanking caps

Cleanliness

Piston locking pins

Check fluid type

Fitment to fluid container

List 2

Using a Risbridger gun

Observe appropriate safety precautions eg: PPE, cleanliness, check correct fluid

Connect the gun

Replenish to correct level

Disconnect the gun

Complete documentation

List 3

Observe appropriate safety precautions eg: PPE, cleanliness, check correct fluid

Connect the gun

Replenish to correct level

Disconnect the gun

Complete documentation

List 4

Aircraft topic 1 and Topic 12
Safety:
Wear personal protection; barrier cream, gloves, goggles
Follow COSHH procedures
Confirm correct oil grade
Preserve cleanliness
Deal with spillages
Minimum oil level
Replenishment:
Risbridger Gun pre-use checks
Check and note oil leaks
Measure contents using eg: sight glass, dipstick, contents indicator, drop stick
Note the time oil levels checked after shutdown
Remove blanking caps
Replenish
Remove Risbridger gun
Fit blanking caps
Correctly Fit engine oil caps
Refit access panels
Complete documentation

List 5

Safety eg:
Confirm correct grade of fuel
Fuel bowser water sediment check
Aircraft water sediment check
Clean refuelling equipment
Earthing: aircraft and bowser in correct sequence
No naked flame,
No starting ground equipment or cycling of aircraft power
Confirm sequence of filling aircraft tanks

Refuel and/or de-fuel, open line or pressure eg:
Calculate existing load
Calculate fuel to be uplifted/removed
Confirm correct fuel type
Earth aircraft and bowser in correct sequence
Connect pressure hose or access gravity fuelling point
Upload/download fuel
Move fuel to correct tanks
Remove fuelling connection
Remove earthing
Complete F705 Fuel Certificate
Report fuel deficiencies

List 6
Eg:
Use correct connector (eg: Mark 6A inflation adapter)
Carry out pre-use checks on gas charging trolley
Ensure hydraulic pressure dissipated
Purge hose
Connect the charging trolley
Charge slowly to correct pressure
Disconnect charging hose
Fit blanking caps
Complete documentation

List 7
On normal and/or emergency systems
Safety eg:
Observe cleanliness
Wear PPE
Confirm correct gas
Check charging trolley connections
Purge the charging hose
Procedure eg:
Note the system contents
Connect the charging hose
Charge the system to maximum level
Ensure gas supply is off
Disconnect the charging hose
Fit blanking covers
Refit access panels
Complete documentation

List 8
Safety eg:
Wear PPE
Correct handling of LOX pack
Observe cleanliness
Check NATO symbol
Procedure eg:
Open access panels
Check aircraft electrical power state
Check contents gauge
Remove/fit electric connector(s)
Remove/fit supply and vent connections
Check and release/engage LOX unit locking devices
Fit/remove LOX pack
Close access panels
Complete documentation

List 9
Pressure check
Visual check of wheels and tyres
Complete documentation.

Unit 106 Flight line maintenance of military aircraft

Notes for guidance

This unit has been produced to meet military aviation training requirements.

On completion of this unit the learner will be able to show a comprehensive knowledge of, and skills in, the flight line maintenance of military aircraft.

Assessment will be designed to demonstrate practical skills and underpinning knowledge of the maintenance procedures.

Unit 109 Fundamentals of military aircraft construction

Level: 2

Credit value: 5

UAN: R/503/0932

Unit aim

To provide learners with a basic understanding of the construction of military airframes and their associated systems.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will:

1. know the general concepts of airframe structures
2. understand structural husbandry procedures for military aircraft
3. understand types of locking and fastening devices used in aircraft
4. know the operation of aircraft hydraulic power systems
5. know the operation of aircraft flight control systems
6. know aircraft landing gear systems
7. know the operation of aircraft ice and rain protection systems
8. understand the operation of aircraft oxygen systems
9. know the operation of aircraft air systems
10. know the operation of aircraft assisted escape systems.

Guided learning hours

It is recommended that **40** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the Level 2 Aeronautical Engineering Level 2 NOS Units 006, 007.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Application of Number
- Communication
- Improving Own Learning and Performance

Assessment and grading

This unit will be assessed by:

- an assignment covering practical skills and underpinning knowledge.

Unit 109 Fundamentals of military aircraft construction

Outcome 1 Know the general concepts of airframe structures

Assessment Criteria

The learner can:

1. describe the need for structural strength
2. describe the construction methods used for airframe and major components
3. describe the construction and operation of entry and exit systems
4. describe the use of adhesives and sealing compounds in aircraft construction.

Range/Scope/Unit content

List 1

Simple description of:
Airframe design requirements
Define aircraft structure
Airworthiness
Simple loads on an aircraft structure
Zone and station identification
Structure classification: primary, secondary and tertiary
Drains and ventilation

List 2

Simple description of:
Airframe construction
Major component construction:
Mainplanes, tail unit, flying controls and undercarriage
Anti-corrosion protection
Simple composite construction methods

List 3

Simple description of eg:
Doors
Emergency exits
Windscreens and windows
Canopies

List 4

Simple description of:
Faying surfaces
Waterproofing
Weather proofing
Sealing integral fuel tanks

Prevent ingress of fumes
Typical sealing and jointing compounds eg:
Chromated jointing compounds
Thiokol based compounds, sealants
Safety precautions.

Unit 109 Fundamentals of military aircraft construction

Outcome 2 Understand structural husbandry procedures for military aircraft

Assessment Criteria

The learner can:

1. explain the need for structural husbandry
2. describe the warning signs and decals used on military aircraft
3. explain the importance of reporting incidents involving composite aircraft structure
4. describe actions to be taken on finding damage on military aircraft.

Range/Scope/Unit content

List 1

Simple description of:
Aircraft safety
Prevention of damage
Reduced fatigue life
Cost
Loss of aircraft use
Aircraft washing and cleaning

List 2

Typical examples eg:
Warning signs
AAES
No step
Hand holds
Footsteps
Maintenance symbols
Fluid codes

List 3

Consequences of not addressing hidden damage
Barely Visible Impact Damage (BVID)

List 4

Reporting procedures
Documentation.

Unit 109 Fundamentals of military aircraft construction

Outcome 3 Understand types of locking and fastening devices used in aircraft

Assessment Criteria

The learner can:

1. explain the purpose of locking and fastening devices
2. describe typical locking and fastening devices used on a military aircraft
3. describe checks required for locking and fastening devices
4. describe flight safety implications of using unsuitable locking and fastening devices.

Range/Scope/Unit content

List 1

Eg: securing components, access panels etc. to preserve structural integrity

Safety implications

List 2

Eg:

Screws

Quick release fasteners

Latching mechanisms

Pins and clips

List 3

Examination of typical devices for eg:

Correct fitment

Correct engagement

Wear

Damage

List 4

Flight safety implications of incorrect type, damage or wear eg:

Loss of life or personal injury

Aircraft loss

Engine damage

Airframe damage

Panel loss

Loss of fluids.

Unit 109 Fundamentals of military aircraft construction

Outcome 4 Know the operation of aircraft hydraulic power systems

Assessment Criteria

The learner can:

1. describe the concept of a hydraulic actuation
2. describe the layout of an aircraft hydraulic power system
3. describe properties of a hydraulic fluid
4. describe indication and warning systems used in hydraulic systems.

Range/Scope/Unit content

List 1

In simple terms:

Fluid pressure

Force

Area

Fluid flow

List 2

A typical layout in simple terms:

Hydraulic components eg:

Reservoir, pumps, filters, jacks and actuators, control valves, accumulators, pipelines

Interface with other hydraulically powered systems

List 3

Basic properties:

Low compressibility

Low freezing point

Lubrication

Low foaming

Good heat transfer

Compatibility with seals

List 4

In simple terms:

Pressure gauges

Pressure switches

Pressure transducers

Warning panel indication

Attention getters.

Unit 109 Fundamentals of military aircraft construction

Outcome 5 Know the operation of aircraft flight control systems

Assessment Criteria

The learner can:

1. describe primary flying controls used on military aircraft
2. describe the meaning of the term 'instinctive control'
3. describe methods of moving flying controls.

Range/Scope/Unit content

List 1

Eg:

Ailerons – roll

Elevators – pitch

Rudder – yaw

Spoilers – increase/decrease lift, roll

All moving tailplane – pitch

Canards (foreplanes) – pitch

Flaps/slats – increase lift

Airbrakes – increase drag

List 2

Define 'instinctive control' eg: 'pilot-initiated control movements in response to a disturbance or a requirement for a change in aircraft attitude'

Examples:

Aircraft moves in direction of control column

Control column-left/right: aircraft rolls left/right

Control column-back/forwards: aircraft pitches nose up/pitches nose down

Rudder pedal- left pedal forwards: aircraft nose yaws left

Rudder pedal- right pedal forwards: aircraft nose yaws right

Trim control

Automatic flight control

List 3

In simple terms eg:

Manual

Hydraulic

Pneumatic

Electric

Fly-by-wire.

Unit 109 Fundamentals of military aircraft construction

Outcome 6 Know aircraft landing gear systems

Assessment Criteria

The learner can:

1. describe configurations of aircraft landing gear systems
2. describe components of aircraft landing gear systems
3. describe how aircraft landing gear systems absorb loads
4. describe how landing gear systems are retracted and extended
5. describe undercarriage steering systems
6. describe wheels and braking systems
7. describe brake parachute and arrestor gear systems.

Range/Scope/Unit content

List 1

In simple terms, typical systems:

Undercarriage configurations: tail wheel, tricycle, bicycle, floats, skids

Wheel configurations eg: single, double, tandem and bogie

List 2

Components: eg: jacks, actuators, micro switches, locks, torque links

List 3

In simple terms:

Shock absorber and damping

List 4

In simple terms:

Extension and retraction systems: normal and emergency, sequence of operation

List 5

In simple terms eg:

Nosewheel steering systems

Bogie steering systems

List 6

In simple terms:

Wheels

Brakes: normal, antiskid and autobraking

Tyres: types; wear and damage limits

List 7

In simple terms:

Arrestor hooks

Brake parachute systems.

Unit 109 Fundamentals of military aircraft construction

Outcome 7 Know the operation of aircraft ice and rain protection systems

Assessment Criteria

The learner can:

1. describe aircraft ice protection systems
2. describe aircraft rain protection systems.

Range/Scope/Unit content

List 1

In simple terms, typical system:

How ice forms

Effect on aircraft

Difference between anti-icing and de-icing

Airframe ice protection

Pitot and instrument system ice protection

Windscreen ice protection

List 2

In simple terms, typical system:

Rain protection

Chemical rain protection

Windscreen wiper systems

Blown air rain clearance systems.

Unit 109 Fundamentals of military aircraft construction

Outcome 8 Understand the operation of aircraft oxygen systems

Assessment Criteria

The learner can:

1. explain the purpose of an oxygen system
2. describe the layout of aircraft gaseous oxygen supply systems
3. describe the layout of aircraft liquid oxygen supply systems
4. describe safety precautions for working with oxygen systems.

Range/Scope/Unit content

List 1

In simple terms:
Oxygen content of air reduces at altitude
Breathing difficulties at altitude
Oxygen needs for aircrew and passengers
Emergency oxygen bottles
Oxygen walk round sets for transport aircraft

List 2

In simple terms, typical system layout:
Normal and emergency supply systems
Oxygen storage bottles
Charging valves
Pipeline supply to cabin/cockpit
Breathing oxygen pipeline markings
Typical oxygen regulators

List 3

In simple terms, typical system layout:
System weight reduction over gaseous system
Physical properties of liquid oxygen
Liquid oxygen container
Pipeline supply to cabin/cockpit
Safety precautions
Personal protective equipment

List 4

Fire
Oils and greases
High pressures
LOX hazards eg: fire, explosion, physiological problems, embrittling effect, pressure increase
Very low temperatures LOX
High temperatures (chemical generators).

Unit 109 Fundamentals of military aircraft construction

Outcome 9 Know the operation of aircraft air systems

Assessment Criteria

The learner can:

1. describe aircraft supply sources
2. describe aircraft cabin pressurisation systems
3. describe aircraft anti-G systems
4. describe aircraft air sub-systems.

Range/Scope/Unit content

List 1

In simple terms typical system:

Air supply sources eg: direct charge air, indirect charge air, ram air

Air bottles

Ground supply trolley

List 2

In simple terms typical system:

Physiological effects of low oxygen at high altitude

Purpose

Operation

List 3

In simple terms typical system:

G forces on the body

Anti-G valve

Test button on anti-G valve

Anti-G suit

List 4

In simple terms typical sub-systems eg:

Ice and rain dispersal

Wing slot seals

Fuel pressurisation

Canopy operating system.

Unit 109 Fundamentals of military aircraft construction

Outcome 10 Know the operation of aircraft assisted escape systems

Assessment Criteria

The learner can:

1. describe the operation of a typical military aircraft AAES
2. describe the components in a typical AAES
3. describe safety precautions to be followed for AAES
4. describe systems which interact with AAES.

.

Range/Scope/Unit content

List 1

Sequence of operation eg: ejection handle pulled, canopy released/MDC fired, seat moves up rail from aircraft, drogue chute deploys, occupant released from seat, parachute deploys

List 2

In simple terms, typical AAES:
Emergency ejection handles
Rocket powered seats
Canopy jettison system
Miniature detonating cord
Command ejection
Parachute pack
Leg restraints
Parachute/seat harness
Seat raising handle

List 2

Typical AAES:
Safe for parking
Safe for maintenance
Pin stowage
AAES maintenance and responsibilities

List 3

Including:
Communications
Anti-G
Oxygen supply
Emergency oxygen.

Unit 109 Fundamentals of military aircraft construction

Notes for guidance

This unit has been produced to meet military aviation training requirements.

On completion of this unit the learner will be able to show a comprehensive knowledge of the airframe construction and systems used in military aircraft.

Assessment is to be designed to demonstrate underpinning knowledge and use of relevant documentation.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Level: 2
Credit value: 5
UAN: J/503/0944

Unit aim

To provide learners with a basic understanding of airframe structural husbandry, inspection and associated simple repair techniques.

Learning outcomes

There are **ten** learning outcomes to this unit. The learner will:

1. know the general concepts of airframe structures
2. know environmental damage to airframe structures
3. know the effects of corrosion on aircraft and components
4. understand the implications of unseen damage to aircraft composite structures
5. know the inspection process for aircraft transparencies
6. know inspection processes for gas turbine engines and its intakes
7. know inspection processes for aircraft pipes, ducts and connectors
8. know the inspection process for aircraft wiring and cables
9. understand the purpose of aircraft husbandry and condition audits
10. understand the removal and neutralisation of corrosive fluid contamination.

Guided learning hours

It is recommended that **40** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the Level 2 Aeronautical Engineering Level 2 NOS Units 006, 007.

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Application of Number
- Communication
- Information and Communication Technology
- Improving Own Learning and Performance
- Problem Solving
- Working with Others

Assessment and grading

This unit will be assessed by:

- an assignment covering practical skills and underpinning knowledge.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 1 Know the general concepts of airframe structures

Assessment Criteria

The learner can:

1. describe need for structural strength in aircraft
2. describe construction methods used for airframes and major components
3. describe aircraft zonal surveys.

Range/Scope/Unit content

List 1

In simple terms:
Airframe design requirements
Define aircraft structure
Airworthiness
Simple loads on an aircraft structure
Structure classification: primary, secondary and tertiary
Importance and classification of damage assessment

List 2

In simple terms:
Airframe construction
Major component construction; including:
Mainplane, tail unit, flying controls and undercarriage,
Simple composite construction methods

List 3

In simple terms:
Purpose
Training and authority levels
Zone reference system
Typical possible defects.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 2 Know environmental damage to airframe structures

Assessment Criteria

The learner can:

1. describe the meaning of the term 'environmental damage'
2. describe the effect of environmental damage
3. describe environmental damage control measures
4. describe anti-erosion materials on aircraft structures
5. describe how to identify environmental damage to an aircraft surface finish
6. describe how to restore surface finishes with environmental damage.

Range/Scope/Unit content

List 1

Physical degradation of material properties including: corrosion and erosion

Surface finish, composite materials

List 2

Loss of structural strength

Reduction in fatigue life

Increased aircraft downtime

Increased costs: time and materials

List 3

Including reasons for:

Reduce flying in environmentally damaging airspace

Control measures including:

Good design

Material selection

Surface treatments

Coatings

Tapes and corrosion

Preventative compounds

Report faults and defects immediately

Timely repairs and preventative maintenance

Minor damage documented

List 4
Typical anti-erosion materials
Structural integrity
Safety precautions
Inspection of surfaces for additional damage
Correct method of replacement

List 5
P.O.L. contamination
Scuffing
Erosion
Abrasion
Reporting procedure and documentation

List 6
Including:
Define depth A repair
SEMPAK touch up kit
Safety precautions
Temporary protective treatments eg: PX24, PX28, PX32.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 3 Know the effects of corrosion on aircraft and components

Assessment Criteria

The learner can:

1. describe the nature of corrosion
2. describe the adverse effect of corrosion on aircraft
3. describe the areas where corrosion is likely to occur
4. describe early signs of corrosion in aircraft materials
5. describe preservation methods to prevent corrosion on aircraft.

Range/Scope/Unit content

List 1

In simple terms including how it forms:
Dry oxidation
Electro-chemical galvanic action
Oxygen
Moisture
Dirt and contaminates
Lack of protective finish
Environment

List 2

Loss of structural strength
Effect on highly stressed components
Cost
Safety

List 3

Including:
External skins
Undercarriage bays
Battery compartments
Fuel tanks; Fugal and bacterial growth
Toilet and galley areas
Bilges and water traps
Helicopter and rotating assemblies
Exhaust area fairings and skins
Rocket and gun blast areas
Leading edges and intakes

List 4

In simple terms, early signs of corrosion in eg:
Ferrous materials
Aluminium alloys
Magnesium alloys
Copper alloys
Paint blistering
Discolouring of protective finish
Loose rivets at seams or joints
Powdery deposits
Prevention eg:

List 5

The importance of effective aircraft husbandry
Precautions including:
Aircraft cleanliness: regular washing and cleaning with appropriate cleaning compounds
Good engineering and trade practices
Prompt repair action for damage
Fitting protective blanks and covers
Correct storage of removed panels and components
Maintain drain holes and ventilation
Cadmium and other protective coatings.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 4 Understand the implications of unseen damage to aircraft composite structures

Assessment Criteria

The learner can:

1. describe where composite materials are used in aircraft construction
2. describe damage found in composite materials
3. explain health and safety risks associated with composite materials
4. describe inspection procedures used for composite materials.

Range/Scope/Unit content

List 1

In simple terms:

Definition eg: combination of two or more different materials eg plywood, concrete

Examples used in aircraft eg:

Glass reinforced plastic (GRP) (eg: radomes, aerial cover panels)

Carbon fibre reinforced plastic (CFRP) (eg: fuselage, skin support structure, wings, flying control surfaces, cabin floors, helicopter blades)

Kevlar reinforced plastic (KRP) (eg: wing and fuselage fairings, leading and trailing edges, landing gear doors, propellers, engine blade containment shields)

List 2

In simple terms typical damage found in aircraft composites eg:

Damage by chemical eg: POL and aircraft cleaning compounds can soften or degrade resins

Erosion and abrasion of surface

Visible Impact Damage (VID)

Barely visible impact damage (BVID)

Delamination

Disbonding

List 3

Airborne fibres when working with material

Respiratory problems

Skin irritation and dermatitis

Eye irritation

Headaches, nausea,

Solvents and resins

Use of Personal Protective Equipment (PPE)

List 4

In simple terms the inspection procedures for eg: abrasion, erosion, cracking, surface finish damage, BVID, delamination

Reporting procedures

Documentation.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 5 Know the inspection process for aircraft transparencies

Assessment Criteria

The learner can:

1. describe how aircraft transparencies are manufactured
2. describe damage found to aircraft transparencies.

Range/Scope/Unit content

List 1

In simple terms

Materials (all of Optical Quality)

Glass eg: good transparency, hard surface, heavy

Acrylic eg: impact resistant, light-weight, easily moulded to complex shapes, increased care to prevent damage, degraded by some chemicals

Polycarbonates eg: high impact resistance, high resistance to temperature change, soft surface easily scratched, used as internal laminate

Vinyl eg: used as a laminate material

List 2

Distortion

Crazing

Scratching and scores

Delamination

Chemical contamination.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 6 Know inspection processes for gas turbine engines and its intakes

Assessment Criteria

The learner can:

1. describe major components of a gas turbine engine
2. describe safety precautions for examining gas turbine engines
3. describe types of damage found on compressor and turbine blades.

Range/Scope/Unit content

List 1

In simple terms:

Intake

Compressor

Combustion chambers

Turbine

Jet pipe

Reheat manifold

Nozzle

Nozzle guide vanes

List 2

Safety assistant

Prevent FOD in intake

Confined space –claustrophobia

Fumes

Heat

Correct inspection light source

Personal protective equipment

List 3

In simple terms, typical damage to eg:

Intake eg: FOD/bird strike damage, pulled rivets, auxiliary door damage, oil or fuel pooling, leading edge damage, anti-icing mat damage

Compressor blades eg: nicks and dent in the blade, cracks at blade root, bent or twisted blades, FOD/bird strike impact, tip rubbing/blade creep

Turbine blades eg: discolouration, metallic deposits, signs of stretched blades

Reporting process and documentation.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 7 Know inspection processes for aircraft pipes, ducts and connectors

Assessment Criteria

The learner can:

1. describe the purpose of rigid pipelines, flexible hoses, ducting and couplings
2. describe the routine inspection of aircraft pipes, hoses, ducts and connectors.

Range/Scope/Unit content

List 1

Eg:

Hydraulic

Fuel

Air

Gas

Coolant

Oxygen

Couplings and connectors:

eg join pipelines together, make positive seal, and allow change of direction

List 2

Inspecting for eg:

Fattening

Kinking

Twisting

Correct routing

Chafing and cuts

Corrosion

Damage to flared ends

Flexible hose lay lines

Heat damage

Minimum bend radii

Braided hose damage to outer covering

Contamination

Blistering

Leaks

Over-tightening of couplings and connectors.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 8 Know the inspection process for aircraft wiring and cables

Assessment Criteria

The learner can:

1. describe the need for husbandry of all aircraft wiring
2. describe inspection processes for aircraft wiring.

Range/Scope/Unit content

List 1

Reasons for husbandry eg:

- Preserve the electrical wiring
- Assure the integrity of the electric system

Husbandry eg:

- Visual checks
- Correct cable support
- Protection through fairleads
- Connectors secure

List 2

Typical damage eg:
Chafing
Cuts
Heat damage
Loose connectors
Cables pulling on terminals.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 9 Understand the purpose of aircraft husbandry and condition audits

Assessment Criteria

The learner can:

1. explain structural airworthiness
2. explain aircraft husbandry and condition audits.

Range/Scope/Unit content

List 1

Including a simple definition eg: the structural integrity of an aircraft enabling it to fly safely without endangering aircrew, passengers or people and property on the ground

List 2

In simple terms:

Preventative maintenance

Ensuring identification and recording of surface damage

Condition audits carried out on regular basis:

Documentation

Aircraft washing

Surface finish inspection

Temporary protective measures.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Outcome 10 Understand the removal and neutralisation of corrosive fluid contamination

Assessment Criteria

The learner can:

1. explain the need to protect aircraft structure and components from contamination
2. explain in procedures for detecting and neutralising contamination.

Range/Scope/Unit content

List 1

Eg:
Dangerous air cargo
Severe corrosion
Damage to protective surfaces
Acids
Alkalis
Mercury
Organic chemicals
Aircraft batteries
Vehicles
Communication equipment
Ground equipment
Fuel tanks
Galley and toilet areas
Medical equipment

List 2

In simple terms the importance of immediate treatment (eg: rapid and aggressive attack by some substances eg: mercury, battery electrolyte, etching agents etc.)
Safety precautions eg: PPE, prevention of spread
Procedures eg:

- Visual signs of attack from substances
- Rapid ingress into small gaps (capillary action)
- Immediate action
- Rapid rate of attack from some substances
- Confirmation by litmus paper
- Correct neutralising solutions
- Testing to ensure surfaces correctly cleaned
- Renewing protective coatings of surfaces
- Mercury capillary brush kit.

Unit 110 Fundamentals of airframe structural inspection and husbandry

Notes for guidance

This unit has been produced to meet military aviation training requirements.

On completion of this unit the learner will be able to show a comprehensive knowledge of the airframe structural husbandry and inspection to the servicing of military aircraft.

Assessment is to be designed to demonstrate underpinning knowledge and use of relevant documentation.

Unit 111 Working safely with aircraft armament systems

Level: 2

Credit value: 5

UAN: D/503/0951

Unit aim

The aim of this unit is to give learners a solid grounding in safe working on aircraft fitted with armament systems and assisted escape systems (AAES).

Learning outcomes

There are **nine** learning outcomes to this unit. The learner will:

1. understand explosive safety
2. understand aircraft assisted escape systems (AAES)
3. know aircraft armament role equipment
4. know aircraft stores management systems
5. know aircraft gun systems
6. know aircraft missiles
7. understand aircraft countermeasure systems
8. know aircraft weapons
9. understand safety precautions for armed aircraft.

Guided learning hours

It is recommended that **40** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Details of the relationship between the unit and relevant national occupational standards

This unit is linked to the Aeronautical Engineering Level 2 NOS Units 7 and 8

Endorsement of the unit by a sector or other appropriate body

This unit is endorsed by SEMTA.

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Application of Number

Assessment and grading (Note: due to the safety implications of this unit, and its product-specific content, the assessment must be centre-set. The pass-mark will be 100% in this case, which is the industry standard.
This unit will be assessed by:

- Centre-set multiple –choice test covering underpinning knowledge
- Centre-set practical assessment.

Unit 111 Working safely with aircraft armament systems

Outcome 1 Understand explosive safety

Assessment Criteria

The learner can:

1. describe what explosives are and how they are categorised
2. describe the explosive train
3. explain explosive lifing
4. describe the dangers of static electricity and explosive devices
5. define thunderstorm risk categories and actions
6. describe general explosive safety rules
7. describe dangers involving armed aircraft
8. state the use of role colours and hazard application bands on explosive devices
9. describe the united nations classification of explosives
10. describe the dangers in relation to radio frequency hazards and explosive devices.

Range/Scope/Unit content

List 1

Define the term 'explosive'
Define terms related to explosives:
Velocity of Detonation
Figure of Power
Figure of Insensitivity
Describe the hierarchy of explosives
Describe the difference between Low and High Explosive

List 2

Eg:
Step-up-System of Detonation
Low explosive train (eg: primer – igniter – propellant)
High explosive train eg:
Two-step (eg: detonator – explosive)
Three step (eg: detonator – booster – main charge)

List 3

Eg:
How explosives deteriorate over time
Effects of environment (temperature, humidity etc)
Labelling and recording of manufacture and expiry dates

List 4

Eg: potential to detonate when in contact with static discharge

List 5

Thunderstorm Category and Definition:

Category 1 (High) - Thunderstorms will develop / have developed in the area

Category 2 (Moderate) - Thunderstorms may develop in the area

Category 3 (Low) - Thunderstorms are not expected in the area. Category and Definition

List 6

General and organisation-specific rules contained in eg:

BAe Systems Explosive & Prohibited Weapons Safety (QMS)

JAP 100A

List 7

Armed aircraft danger areas potential risks

Eg:

Front – Guns, Missiles and Rockets.

Rear – Missiles, Rockets, Chaff and Flare, Towed Decoy, Smoke Marker/Sonar buoy Discharger.

Generally- Bombs, Ejector Release Units, Drop Tanks, Explosive Start Valves

List 8

Colour Coding and Marking of Stores:

Explosive stores carry markings used to indicate:

Primary role

Degree of danger or hazard to personnel who come in contact or handle them

List 9

Reason eg: to facilitate fire fighting

Explosives and ammunition divided according to their behaviour when involved in a fire

Symbols: orange coloured with black numerals denoting the fire division

List 10

Eg: spontaneous detonation of EEDs in the presence of external RF radiation

Define ‘intrinsically safe’.

Unit 111 Working safely with aircraft armament systems

Outcome 2 Understand aircraft assisted escape systems (AAES)

Assessment Criteria

The learner can:

1. describe ejection seats fitted to military fast-jet aircraft
2. describe ejection seat major assemblies
3. describe the purpose of ejection seat components
4. describe Command Ejection systems
5. describe Canopy Jettison and Fragmentation Systems.

Range/Scope/Unit content

List 1

One or more seats eg: Tornado, Typhoon
Including safety pin positions and other device selections for:
Safe for Parking
Safe for Maintenance

List 2

Description of:
BTRU
Drogue Gun
Head Box
Top Latch Assembly
Firing Units
Cartridges
Main Gun
QRF
Rocket Pack

List 3

Locate and explain the purpose of:
Main beam assembly
Main Gun Assembly
Top Latch Assembly
Seat pan Assembly
Parachute harness and head box
Quick Release Fittings (QRF)
Barostatic Time Release Unit (BTRU)
Drogue Gun/Parachute Deployment Unit (PDU)
Emergency Oxygen System (EO2)
Leg/Limb Restraint Systems
Harness Power Retraction Unit (HPRU)
Personal Equipment Conector (PEC)

Personal Survival Pack (PSP)
Auto Deployment Unit (ADU)
Auto Liferaft Inflation Unit (ALIU)
Trip rods
Armed/Safe/Egress Handle

List 4
For specific aircraft eg: Tornado, Typhoon:
Command Control Valve
Command Ejection Controller
Command Mode Selector

List 5
For specific aircraft eg: Tornado, Typhoon eg:

- MDC
- CLC.

Unit 111 Working safely with aircraft armament systems

Outcome 3 Know aircraft armament role equipment

Assessment Criteria

The learner can:

1. identify types of suspension lugs
2. identify items of carriage and release equipment used on aircraft
3. explain the operation of carriage and release equipment.

Range/Scope/Unit content

List 1

Purpose of including:

Bail Lugs

MACE Lugs

List 2

Including:

Wing Pylons

Fuselage Pylons

Twin Store Carrier (TSC)

Carrier Bomb Light Store (CBLS)

Ejector Release Units (ERU): No.122EX; LDERU; HDERU; ALDERU; AHDERU

Fuzing Units

List 3

Operation and purpose of including:

Wing Pylons

Fuselage Pylons

Twin Store Carrier (TSC)

Carrier Bomb Light Store (CBLS)

Ejector Release Units (ERU)

Fuzing Units.

Unit 111 Working safely with aircraft armament systems

Outcome 4 Know aircraft stores management systems (SMS)

Assessment Criteria

The learner can:

1. state the purpose of a SMS
2. identify the components of the SMS.

Range/Scope/Unit content

List 1

For typical aircraft:

Requirement for managing armament stores

Basic function of the SMS

List 2

Including:

Weapon Programming Unit

Weapon Control Panels

Attack / Weapon Release Button

Master Armament Safety Switch (MASS)

Late Arm Switch

Selective / Emergency Jettison

Trigger

Armament System Ground Test Switch (ASGTS).

Unit 111 Working safely with aircraft armament systems

Outcome 5 Understand aircraft gun systems

Assessment Criteria

The learner can:

1. state the purpose of aircraft gun systems
2. identify components of aircraft gun systems
3. explain the operation of aircraft gun systems.

Range/Scope/Unit content

List 1

Specific aircraft eg: Tornado, Typhoon

List 2

Locate and name components eg:
Breech
Barrel
Cocking mechanism

List 3

Eg:
Loading ammunition tanks
Cocking
Firing
Spent case ejection
Ammunition feed
Live round insertion.

Unit 111 Working safely with aircraft armament systems

Outcome 6 Know aircraft missiles

Assessment Criteria

The learner can:

1. identify air-to-air and air-to-ground missiles
2. identify components of an air-to-air missile
3. explain the operation of an air-to-air missile.

Range/Scope/Unit content

List 1

Identify and name missiles eg:

Sidewinder

ASRAAM

Brimstone

ALARM

List 2

Identify and name components of eg: Sidewinder

List 3

Explain the purpose and operation of eg: Sidewinder.

Unit 111 Working safely with aircraft armament systems

Outcome 7 Understand aircraft countermeasure systems

Assessment Criteria

The learner can:

1. identify countermeasure systems used on aircraft
2. state the purpose of countermeasure systems
3. explain the operation of countermeasure systems.

Range/Scope/Unit content

List 1

Eg:
Chaff
Flare

List 2

Eg: to disrupt and distract enemy airborne target acquisition systems

List 3

Including:
Chaff dispensers and the action of chaff
Flare dispensers and the action of flares.

Unit 111 Working safely with aircraft armament systems

Outcome 8 Know aircraft weapons

Assessment Criteria

The learner can:

1. identify bomb types including
2. identify major bomb components
3. identify role and hazard colour coding.

Range/Scope/Unit content

List 1

Eg:

3kg and14kg practice bombs

List 2

Tail units

Shear Wires

Lead Electrical Fuzing and Arming (LEFA)

List 3

Colour Coding and Marking of Stores

Unit 111 Working safely with aircraft armament systems

Outcome 9 Understand safety precautions for armed aircraft

Assessment Criteria

The learner can:

1. understand safety precautions relating to armed aircraft.

Range/Scope/Unit content

List 1

Including:

Aircraft Armed signs
Safe Approach to the aircraft
Angle of approach
Check the Master Armament Safety Switch
Undercarriage locks and earthing leads.

Unit 111 Working safely with aircraft armament systems

Notes for guidance

This unit has been designed to cover the essential safety knowledge required by all personnel working on or near aircraft that are fitted with any weapon or device that includes explosive charges. The nature of the subject requires a clear, unambiguous understanding of all of the safety rules, instructions and procedures and this unit allows recognition of an individual's achievement of that understanding. The knowledge in this unit will be assessed by both written and practical (walk-through) means to ensure that the learner is able to relate class-room knowledge to real working environments.

Appendix 1 Relationships to other qualifications

Literacy, language, numeracy and ICT skills development

This qualification can develop skills that can be used in the following qualifications:

- Functional Skills (England) – see **www.cityandguilds.com/functionalskills**
- Essential Skills (Northern Ireland) – see **www.cityandguilds.com/essentialskillsni**
- Essential Skills Wales –see **www.cityandguilds.com/esw**

Appendix 2 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

Centre Manual - Supporting Customer Excellence contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification, as well as updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document includes sections on:

- The centre and qualification approval process
- Assessment, internal quality assurance and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal quality assurance
- External quality assurance.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents such as:

- SQA Awarding Body Criteria (2007)
- NVQ Code of Practice (2006)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

Access to Assessment & Qualifications provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The **centre homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate candidates on line
- **Events**: dates and information on the latest Centre events
- **Online assessment**: how to register for e-assessments.

Useful contacts

UK learners **General qualification information**	**T: +44 (0)844 543 0033** **E: learnersupport@cityandguilds.com**
International learners General qualification information	T: +44 (0)844 543 0033 F: +44 (0)20 7294 2413 E: **intcg@cityandguilds.com**
Centres Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **centresupport@cityandguilds.com**
Single subject qualifications Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: **singlesubjects@cityandguilds.com**
International awards Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **intops@cityandguilds.com**
Walled Garden Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413 E: **walledgarden@cityandguilds.com**
Employer Employer solutions, Mapping, Accreditation, Development Skills, Consultancy	T: +44 (0)121 503 8993 E: **business@cityandguilds.com**
Publications Logbooks, Centre documents, Forms, Free literature	T: +44 (0)844 543 0000 F: +44 (0)20 7294 2413

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: feedbackandcomplaints@cityandguilds.com

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. We offer over 500 qualifications across 28 industries through 8500 centres worldwide and award around two million certificates every year. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa), and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Land Based Services (land-based qualifications), the Centre for Skills Development (CSD works to improve the policy and practice of vocational education and training worldwide) and Learning Assistant (an online e-portfolio).

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