

**THE REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

 **FOR**

 **AERONAUTICAL AIRFRAME AND POWER PLANT TECHNICIAN**

**LEVEL 6**



TVET CDACC

P.O BOX 15745-00100

NAIROBI

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**Council Secretary/CEO**

**TVET Curriculum Development, Assessment and Certification Council**

**P.O. Box 15745–00100**

**Nairobi, Kenya**

**Email:** **info@tvetcdacc.go.ke**

# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya 2010 and this resulted in the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the Technical and Vocational Education and Training (TVET) training.

This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes. These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these Occupational Standards were developed for purpose of developing a competency-based curriculum for Aeronautical Engineering (Airframes and Power Plant)**.** These Occupational Standards will also be the basis for assessment of an individual for competence certification.

It is my conviction that these Occupational Standards will play a great role towards development of competent human resource for the Engineering Sector’s growth and development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labor force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Engineering Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for Aeronautical Airframe and Power Plant Technician. These standards will be the basis for development of competency based curriculum for Aeronautical Engineering (Airframe and Power Plant Option) Level 6.

The occupational standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to the Council Members, Council Secretariat, Engineering SSAC, expert workers and all those who participated in the development of these Occupational Standards.

**CHAIRPERSON, TVET CDACC**

# ACKNOWLEDGMENT

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am thankful to the management of these organizations for allowing their staff to participate in this exercise. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to Engineering Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I thank all the individuals and organizations who participated in the validation of these Standards.

I acknowledge all other institutions which in one way or another contributed to the development of these Standards.

**CHAIRPERSON,**

**ENGINEERING SECTOR SKILLS ADVISORY COMMITTEE**

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**ABBREVIATION AND ACRONYMS**

A Control version

AC Air conditioning

AFE Airframe Engineering

AIDS Acquired Immunodeficiency Syndrome

AMM Aircraft Maintenance Manual

BC Basic unit of Competency

CBET Competency Based Education and Training

CC Common unit of Competency

CDACC Curriculum Development Assessment Certification Council

CEO Council Secretary

CI Compression ignition

CMM Component Maintenance Manual

CPU Central Processing Unit

CPU Control Powering Unit

CR Core Unit of Competency

CV Constant velocity joint

DTI Dial test indicator

FOT Fixed orifice tube

GPS Global positioning system

HIV Acquired Immunodeficiency Virus

IATA International Air Transport Association

ICT Information Communication Technology

IT Information Technology

KCAA Kenya Civil Aviation Authority

KCSE Kenya Certificate of Secondary Education

KNQA Kenya National Qualification Authority

KNQF Kenya National Qualification Framework

KPI King Pin inclination

OBD On-board diagnostics

OS Occupational Standards

OSH Occupational Safety and Health

PESTEL Political Environmental Social Technological Economic Legal

PPE Personal Protective Equipment

SOPStandard Operating Procedure

SSAC Sector Skills Advisory Committee

SWOT Strength Weakness Opportunity Threat

TVET Technical and Vocational Education and Training

# **KEY TO UNIT CODE**

 **ENG/OS /AFE /BC /01/6 /A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

# OVERVIEW

The Airframe Technician Level 6 qualification consists of competencies that a person must achieve to enable him/her to work in aviation industry. It entails producing airframe, carrying out aircraft interior soft furnishing, maintaining aircraft engine and aircraft hydraulic system, carrying out aircraft pneumatic system maintenance, servicing aircraft fuel system, maintaining aircraft de-icing and rain protection system, servicing aircraft power transmission system, maintaining aircraft fire protection system, aircraft oxygen systems, aircraft environmental control systems, performing aircraft exterior works and manage aviation maintenance projects.

The units of competency comprising Aeronautical Airframe and Power Plant Technician level 6 include the basic, common and core units competency as shown below:

**Basic Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/AFE/BC/01/6/A | Demonstrate Communication Skills |
| ENG/OS/AFE/BC/02/6/A | Demonstrate Digital Literacy |
| ENG/OS/AFE/BC/03/6/A | Demonstrate Entrepreneurial Skills |
| ENG/OS/AFE/BC/04/6/A | Demonstrate Employability Skills |
| ENG/OS/AFE/BC/05/6/A | Demonstrate Environmental Literacy |
| ENG/OS/AFE/BC/06/6/A | Demonstrate Occupational Health and Safety Practices |

**Common Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/AFE/CC/01/6/A | Prepare And Interpret Technical Drawings |
| ENG/OS/AFE/CC/02/6/A | Apply Engineering Mathematics |
| ENG/OS/AFE/CC/03/6/A | Apply Aerodynamics Principles |
| ENG/OS/AFE/CC/04/6/A | Perform Workshop Processes and Practices  |

**Core Units of Competency**

|  |  |
| --- | --- |
| **Unit Code** | **Unit Title** |
| ENG/OS/AFE/CR/01/6/A | Produce Airframe |
| ENG/OS/AFE/CR/02/6/A | Carry Out Aircraft Interior Soft Furnishing |
| ENG/OS/AFE/CR/03/6/A | Maintain Aircraft Engine |
| ENG/OS/AFE/CR/04/6/A | Maintain Aircraft Hydraulic System |
| ENG/OS/AFE/CR/05/6/A | Carry Out Aircraft Pneumatic System Maintenance |
| ENG/OS/AFE/CR/06/6/A | Service Aircraft Fuel System |
| ENG/OS/AFE/CR/07/6/A | Maintain Aircraft De-Icing And Rain Protection System |
| ENG/OS/AFE/CR/08/6/A | Service Aircraft Power Transmission System |
| ENG/OS/AFE/CR/09/6/A | Maintain Aircraft Fire Protection System |
| ENG/OS/AFE/CR/10/6/A | Maintain Aircraft Oxygen Systems |
| ENG/OS/AFE/CR/11/6/A | Maintain Aircraft Environmental Control Systems |
| ENG/OS/AFE/CR/12/6/A | Perform Aircraft Exterior Works |
| ENG/OS/AFE/CR/13/6/A | Manage Aviation Maintenance Projects |

# BASIC UNITS OF COMPETENCY

# DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE:** ENG/OS/AFE/BC/01/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate communication skills. It involves meeting communication needs of clients and colleagues, developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Meet communication needs of clients and colleagues
 | 1. Specific communication needs of clients and colleagues are identified and met based on workplace requirements
2. Different communication approaches are identified and applied according to clients’ needs
3. Conflict is identified and addressed as per the standards of the organization
 |
| 1. Develop communication strategies
 | * 1. Strategies for effective internal and external dissemination of information are developed as per organization’s requirements
	2. Special communication needs are considered in developing strategies according workplace procedures
	3. ***Communication strategies*** are analyzed, evaluated and revised based the workplace needs
 |
| 1. Establish and maintain communication pathways
 | * 1. Pathways of communication are established as per organization policy
	2. Pathways are maintained and reviewed according to organization procedures
 |
| 1. Promote use of communication strategies
 | * 1. Information is provided to all areas of the organization as per strategy requirements
	2. Effective communication techniques are articulated and modeled according work requirements
	3. Personnel are given guidance about adapting communication strategies as per organization procedures
 |
| 1. Conduct interview
 | 1. A range of appropriate communication strategies are employed in ***interview situations*** based on the workplace requirements
2. Records of interviews are made and maintained in accordance with organizational procedures
3. Effective questioning, listening and nonverbal communication techniques are used as per needs
 |
| 1. Facilitate group discussion
 | 1. Mechanisms to enhance ***effective group interaction*** are identified and implemented according to workplace requirements
2. Strategies to encourage group participation are identified and used as per organizations’ procedures
3. Meetings objectives and agenda are set and followed based on workplace requirements
4. Relevant information is provided and feedback obtained according to set protocols
5. Evaluation of group communication strategies is undertaken in accordance with workplace guidelines
6. Specific communication needs of individuals are identified and addressed as per individual needs
 |
| 1. Represent the organization
 | 1. 7Relevant presentation are researched and presented based on internal or external communication forums requirements
2. Presentation is delivered in a clear and sequential manner as per the predetermined time
3. Presentation is made as per appropriate media
4. Difference views are respected based on workplace procedures
5. Written communication is done as per organizational standards
6. Inquiries are responded according to organizational standard
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Communication strategies may include but not limited to:
 | * Language switch
* Comprehension check
* Repetition
* Asking confirmation
* Paraphrase
* Clarification request
* Translation
* Restructuring
* Approximation
* Generalization
 |
| 1. Effective group interaction may include but not limited to:
 | * Identifying and evaluating what is occurring within an interaction in a nonjudgmental way
* Using active listening
* Making decision about appropriate words, behavior
* Putting together response which is culturally appropriate
* Expressing an individual perspective
* Expressing own philosophy, ideology and background and exploring impact with relevance to communication
 |
| 1. Situations may include but not limited to:
 | * Establishing rapport
* Eliciting facts and information
* Facilitating resolution of issues
* Developing action plans
* Diffusing potentially difficult situations
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Active listening
* Interpretation
* Negotiation
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Communication process
* Dynamics of groups
* Styles of group leadership
* Key elements of communications strategy

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate: 1. Developed communication strategies to meet the organization requirements and applied in the workplace
2. Established and maintained communication pathways for effective communication in the workplace
3. Used communication strategies involving exchanges of complex oral information
 |
| 1. Resource Implications
 | The following resources should be provided: 1. Access to relevant workplace or appropriately simulated environment where assessment can take place
2. Materials relevant to the proposed activity or tasks
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: 1. Direct observation
2. Oral questioning
3. Written texts
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On-the-job
2. Off-the –job
3. During Industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE DIGITAL LITERACY**

**UNIT CODE:** ENG/OS/AFE/BC/02/6/A

**UNIT DESCRIPTION**

This unit describes competencies required to demonstrate digital literacy. It involves, identifying computer software and hardware, applying security measures to data, hardware, and software in automated environment, applying computer software in solving task, applying internet and email in communication at workplace, applying desktop publishing in official assignments and preparing presentation packages.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify appropriate computer software and hardware
 | * 1. Concepts of ICT are determined in accordance with computer equipment
	2. Classifications of computers are determined in accordance with manufacturers specification
	3. Appropriate computer software is identified according to manufacturer’s specification
	4. Appropriate computer hardware is identified according to manufacturer’s specification
	5. Functions and commands of operating system are determined in accordance with manufacturer’s specification
 |
| 1. Apply security measures to data, hardware, software in automated environment
 | * 1. ***Data security and privacy are classified*** in accordance with the prevailing technology
	2. ***Security threats*** reidentified ***and control measures*** are applied in accordance with laws governing protection of ICT
	3. Computer threats and crimes are detected in accordance to Information Management security guidelines
	4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
 |
| 1. Apply computer software in solving tasks
 | * 1. ***Word processing concepts*** are applied in resolving workplace tasks, report writing and documentation as per the job requirements
	2. ***Word processing utilities*** are applied in accordance with workplace procedures
	3. Worksheet layout is prepared in accordance with work procedures
	4. Worksheet is built and data manipulated in the worksheet in accordance with workplace procedures
	5. Continuous data manipulated on worksheet is undertaken in accordance with work requirements
	6. Database design and manipulation is undertaken in accordance with office procedures
	7. Data sorting, indexing, storage, retrieval and security is provided in accordance with workplace procedures
 |
| 1. Apply internet and email in communication at workplace
 | * 1. Electronic mail addresses are opened and applied in workplace communication in accordance with office policy
	2. Office internet functions are defined and executed in accordance with office procedures
	3. ***Network configuration*** is determined in accordance with office operations procedures
	4. Official World Wide Web is installed and managed according to workplace procedures
 |
| 1. Apply Desktop publishing in official assignments
 | * 1. Desktop publishing functions and tools are identified in accordance with manufactures specifications
	2. Desktop publishing tools are developed in accordance with work requirements
	3. Desktop publishing tools are applied in accordance with workplace requirements
	4. Typeset work is enhanced in accordance with workplace standards
 |
| 1. Prepare presentation packages
 | * 1. Types of presentation packages are identified in accordance with office requirements
	2. Slides are created and formulated in accordance with workplace procedures
	3. Slides are edited and run-in accordance with work procedures
	4. Slides and handouts are printed according to work requirements
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Appropriate computer hardware may include but not limited to:
 | Collection of physical parts of a computer system such as:* Computer case, monitor, keyboard, and mouse
* All the parts inside the computer case, such as the hard disk drive, motherboard and video card
 |
| 1. Data security and privacy may include but not limited to:
 | * Confidentiality of data
* Cloud computing
* Integrity -but-curious data surfing
 |
| 1. Security and control measures may include but not limited to:
 | * Counter measures against cyber terrorism
* Risk reduction
* Cyber threat issues
* Risk management
* Pass-wording
 |
| 1. Security threats may include but not limited to:
 | * Cyber terrorism
* Hacking
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical skills
* Interpretation
* Typing
* Communication
* Computing (applying fundamental operations such as addition, subtraction, division and multiplication)
* Using calculator
* Basic ICT skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Software concept
* Functions of computer software and hardware
* Data security and privacy
* Computer security threats and control measures
* Technology underlying cyber-attacks and networks
* Cyber terrorism
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheets;
* Meaning, formulae, function and charts, uses and layout
* Data formulation, manipulation and application to cells
* Database;
* Database design, data manipulation, sorting, indexing, storage retrieval and security
* Desktop publishing;
* Designing and developing desktop publishing tools
* Manipulation of desktop publishing tools
* Enhancement of typeset work and printing documents
* Presentation Packages;
* Types of presentation Packages
* Creating, formulating, running, editing, printing and presenting slides and handouts
* Networking and Internet;
* Computer networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and integrate emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

**EVIDENCE** **GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Identified and controlled security threats
	2. Detected and protected computer crimes
	3. Applied word processing in office tasks
	4. Designed, prepared work sheet and applied data to the cells in accordance to workplace procedures
	5. Opened electronic mail for office communication as per workplace procedure
	6. Installed internet and World Wide Web for office tasks in accordance with office procedures
	7. Integrated emerging issues in computer ICT applications
	8. Applied laws governing protection of ICT
 |
| 1. Resource Implications
 |  The following resources should be provided:* 1. Access to relevant workplace where assessment can take place
	2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Observation
	2. Oral questioning
	3. Written test
	4. Portfolio of Evidence
	5. Interview
	6. Third party report
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On-the-job
2. Off-the –job
3. During Industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENTREPRENEURIAL SKILLS**

**UNIT CODE :** ENG/OS/AFE/BC/03/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship, and self-employment, identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation, developing business innovative strategies and developing business plan.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT** | **PERFORMANCE CRITERIA**  |
| 1. Demonstrate understanding of an Entrepreneur
 | 1. Entrepreneurs and Business persons are distinguished as per principles of entrepreneurship
2. ***Types of entrepreneurs*** are identified as per principles of entrepreneurship
3. Ways of becoming an Entrepreneur are identified as per principles of Entrepreneurship
4. ***Characteristics of Entrepreneurs*** are identified as per principles of Entrepreneurship
5. Factors affecting Entrepreneurship development are explored as per principles of Entrepreneurship
 |
| 1. Demonstrate understanding of Entrepreneurship and self-employment
 | 1. Entrepreneurship and self-employment are distinguished as per principles of entrepreneurship
2. Importance of self-employment is analysed based on business procedures and strategies
3. ***Requirements for entry into self-employment*** are identified according to business procedures and strategies
4. Role of an Entrepreneur in business is determined according to business procedures and strategies
5. Contributions of Entrepreneurs to National development are identified as per business procedures and strategies
6. Entrepreneurship culture in Kenya is explored as per business procedures and strategies
7. Born or made Entrepreneurs are distinguished as per entrepreneurial traits
 |
| 1. Identify Entrepreneurship opportunities
 | 1. Sources of business ideas are identified as per business procedures and strategies
2. Business ideas and opportunities are generated as per business procedures and strategies
3. Business life cycle is analysed as per business procedures and strategies
4. Legal aspects of business are identified as per procedures and strategies
5. Product demand is assessed as per market strategies
6. Types of ***business environment*** are identified and evaluated as per business procedures
7. Factors to consider when evaluating business environment are explored based on business procedure and strategies
8. Technology in business is incorporated as per best practice
 |
| 1. Create entrepreneurial awareness
 | 1. ***Forms of businesses*** are explored as per business procedures and strategies
2. Sources of business finance are identified as per business procedures and strategies
3. Factors in selecting source of business finance are identified as per business procedures and strategies
4. ***Governing policies*** on Small Scale Enterprises (SSEs) are determined as per business procedures and strategies
5. Problems of starting and operating SSEs are explored as per business procedures and strategies
 |
| 1. Apply entrepreneurial motivation
 | 1. ***Internal and external motivation*** factors are determined in accordance with motivational theories
2. Self-assessment is carried out as per entrepreneurial orientation
3. Effective communications are carried out in accordance with communication principles
4. Entrepreneurial motivation is applied as per motivational theories
 |
| 1. Develop innovative business strategies
 | 1. Business innovation strategies are determined in accordance with the organization strategies
2. Creativity in business development is demonstrated in accordance with business strategies
3. ***Innovative business strategies*** are developed as per business principles
4. Linkages with other entrepreneurs are created as per best practice
5. ICT is incorporated in business growth and development as per best practice
 |
| 1. Develop Business Plan
 | 1. Identified Business is described as per business procedures and strategies
2. Marketing plan is developed as per business plan format
3. Organizational/Management plan is prepared in accordance with business plan format
4. Production/operation plan in accordance with business plan format
5. Financial plan is prepared in accordance with the business plan format
6. Executive summary is prepared in accordance with business plan format
7. Business plan is presented as per best practice
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Types of entrepreneurs may include but not limited to:
 | * Innovators
* Imitators
* Craft
* Opportunistic
* Speculators
 |
| 1. Characteristics of Entrepreneurs may include but not limited to:
 | * Creative
* Innovative
* Planner
* Risk taker
* Networker
* Confident
* Flexible
* Persistent
* Patient
* Independent
* Future oriented
* Goal oriented
 |
| 1. Requirements for entry into self-employment may include but not limited to
 | * Technical skills
* Management skills
* Entrepreneurial skills
* Resources
* Infrastructure
 |
| 1. Internal and external motivation may include but not limited to:
 | * Interest
* Passion
* Freedom
* Prestige
* Rewards
* Punishment
* Enabling environment
* Government policies
 |
| 1. Business environment may include but not limited to:
 | * External
* Internal
* Intermediate
 |
| 1. Forms of businesses may include but not limited to:
 | * Sole proprietorship
* Partnership
* Limited companies
* Cooperatives
 |
| 1. Governing policies may include but not limited to:
 | * Increasing scope for finance
* Promoting cooperation between entrepreneurs and private sector
* Reducing regulatory burden on entrepreneurs
* Developing IT tools for entrepreneurs
 |
| 1. Innovative business strategies may include but not limited to:
 | * New products
* New methods of production
* New markets
* New sources of supplies
* Change in industrialization
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Analytical
* Management
* Problem-solving
* Root-cause analysis
* Communication

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Decision making
* Business communication
* Change management
* Competition
* Risk
* Net working
* Time management
* Leadership
* Factors affecting entrepreneurship development
* Principles of Entrepreneurship
* Features and benefits of common operational practices, e. g., continuous improvement (kaizen), waste elimination,
* Conflict resolution
* Health, safety and environment (HSE) principles and requirements
* Customer care strategies
* Basic financial management
* Business strategic planning
* Impact of change on individuals, groups and industries
* Government and regulatory processes
* Local and international market trends
* Product promotion strategies
* Market and feasibility studies
* Government and regulatory processes
* Local and international business environment
* Relevant developments in other industries
* Regional/ County business expansion strategies

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | 1. Assessment requires evidence that the candidate:
2. Distinguished entrepreneurs and businesspersons correctly
3. Identified ways of becoming an entrepreneur appropriately
4. Explored factors affecting entrepreneurship development appropriately
5. Analysed importance of self-employment accurately
6. Identified requirements for entry into self-employment correctly
7. Identified sources of business ideas correctly
8. GeneratedBusiness ideas and opportunities correctly
9. Analysed business life cycle accurately
10. Identified legal aspects of business correctly
11. Assessed product demand accurately
12. Determined Internal and external motivation factors appropriately
13. Carried out communications effectively
14. Identified sources of business finance correctly
15. Determined Governing policy on small scale enterprise appropriately
16. Explored problems of starting and operating SSEs effectively
17. Developed Marketing, Organizational/Management, Production/Operation and Financial plans correctly
18. Prepared executive summary correctly
19. Determined business innovative strategies appropriately
20. Presented business plan effectively
 |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | 1. Written tests
2. Oral questions
3. Third party report
4. Interviews
5. Portfolio of Evidence
 |
| 1. Context of Assessment
 | Competency may be assessed 1. On-the-job
2. Off-the –job
3. During Industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE EMPLOYABILITY SKILLS

**UNIT CODE:** ENG/OS/AFE/BC/04/6/A

**UNIT DESCRIPTON**

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Conduct self-management
 | 1. Personal vision, mission and goals are formulated based on potential and in relation to organization objectives
2. Emotional intelligence is demonstrated as per workplace requirements.
3. Individual performance is evaluated and monitored according to the agreed targets.
4. Assertiveness is developed and maintained based on the requirements of the job.
5. Accountability and responsibility for own actions are demonstrated based on workplace instructions.
6. Self-esteem and a positive self-image are developed and maintained based on values.
7. Time management, attendance and punctuality are observed as per the organization policy.
8. Goals are managed as per the organization’s objective
9. Self-strengths and weaknesses are identified based on personal objectives
 |
| 1. Demonstrate interpersonal communication
 | 1. Writing skills are demonstrated as per communication policy
2. Negotiation and persuasion skills are demonstrated as per communication policy
3. Internal and external stakeholders’ needs are identified and interpreted as per the communication policy
4. Communication networks are established based on workplace policy
5. Information is shared as per communication policy
 |
| 1. Demonstrate critical safe work habits
 | * 1. Stress is managed in accordance with workplace policy.
	2. Punctuality and time consciousness is demonstrated in line with workplace policy.
	3. Personal objectives are integrated with organization goals based on organization’s strategic plan.
	4. ***Resources*** are utilized in accordance with workplace policy.
	5. Work priorities are set in accordance to workplace goals and objectives.
	6. Leisure time is recognized and utilized in line with personal objectives.
	7. ***Drugs and substances of abuse*** are identified and avoided based on workplace policy.
	8. HIV and AIDS prevention awareness is demonstrated in line with workplace policy.
	9. Safety consciousness is demonstrated in the workplace based on organization safety policy.
	10. ***Emerging issues*** are identified and dealt with in accordance with organization policy.
 |
| 1. Lead a workplace team
 | 1. Performance targets for the ***team*** are set based on organization’s objectives
2. Duties are assigned in accordance with the organization policy.
3. ***Forms of communication*** in a team are established according to organization’s policy.
4. Team performance is evaluated based on set targets as per workplace policy.
5. Conflicts are resolved between team members in line with organization policy.
6. Gender related issues are identified and mainstreamed in accordance workplace policy.
7. Human rights and fundamental freedoms are identified and respected as Constitution of Kenya 2010.
8. Healthy relationships are developed and maintained in line with workplace.
 |
| 1. Plan and organize work
 | 1. Work plans are prepared based on activities and budget.
2. Assigned tasks are interpreted and expectations identified as per the workplace instructions.
3. Task occupational safety and health requirements are identified and observed regulations.
4. Work resources are identified, mobilized, allocated and utilized based on organization work plans.
5. Work activities are monitored and evaluated in line with work plans and workplace policy.
6. Work plans are reviewed based on target and available resources.
 |
| 1. Maintain professional growth and development
 | * 1. Personal training needs are identified and assessed in line with the requirements of the job.
	2. ***Training and career opportunities*** are identified and utilized based on job requirements.
	3. Resources for training are mobilized and allocated based organizations and individual skills needs.
	4. Licensees and certifications relevant to job and career are obtained and renewed as per policy.
	5. Work priorities and personal commitments are balanced and managed based on requirements of the job and personal objectives.
	6. Recognitions are sought as proof of career advancement in line with professional requirements.
 |
| 1. Demonstrate workplace learning
 | * 1. Learning opportunities are sought and managed based on job requirement and organization policy.
	2. Improvement in performance is demonstrated based on courses attended.
	3. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job
	4. Time and effort is invested in learning new skills based on job requirements
	5. Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.
	6. New systems are developed and maintained in accordance with the requirements of the job.
	7. Awareness of personal role in workplace ***innovation*** is demonstrated based on requirements of the job.
 |
| 1. Demonstrate problem solving skills
 | * 1. Creative, innovative and practical solutions are developed based on the problem
	2. Independence and initiative in identifying and solving problems is demonstrated based on requirements of the job.
	3. Team problems are solved as per the workplace guidelines
	4. Problem solving strategies are applied as per the workplace guidelines
	5. Problems are analyzed and assumptions tested as per the context of data and circumstances
 |
| 1. Manage ethical performance
 | * 1. Policies and guidelines are observed as per the workplace requirements
	2. Self-worth and professionalism is exercised in line with personal goals and organizational policies
	3. Code of conduct is observed as per the workplace requirements
	4. Integrity is demonstrated as per legal requirement
 |

**RANGE**

This section provides work environment and conditions to which the performance criteria apply. It allows for different work environment and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Drug and substance abuse may include but not limited to:
 | Commonly abused* Alcohol
* Tobacco
* Miraa
* Over-the-counter drugs
* Cocaine
* Bhang
* Glue
 |
| 1. Feedback may include but not limited to:
 | * Verbal
* Written
* Informal
* Formal
 |
| 1. Relationships may include but not limited to:
 | * Man/Woman
* Trainer/trainee
* Employee/employer
* Client/service provider
* Husband/wife
* Boy/girl
* Parent/child
* Sibling relationships
 |
| 1. Forms of communication may include but not limited to:
 | * Written
* Visual
* Verbal
* Non verbal
* Formal and informal
 |
| 1. Team may include but not limited to:
 | * Small work group
* Staff in a section/department
* Inter-agency group
 |
| 1. Personal growth may include but not limited to:
 | * Growth in the job
* Career mobility
* Gains and exposure the job gives
* Net workings
* Benefits that accrue to the individual as a result of noteworthy performance
 |
| 1. Personal objectives may include but not limited to:
 | * Long term
* Short term
* Broad
* Specific
 |
| 1. Trainings and career opportunities may includes but not limited to
 | * Participation in training programs
* Serving as Resource Persons in conferences and workshops
 |
| 1. Resource may include may but not limited to:
 | * Human
* Financial
* Technology
 |
| 1. Innovation may include but not limited to:
 | * New ideas
* Original ideas
* Different ideas
* Methods/procedures
* Processes
* New tools
 |
| 1. Emerging issues may include but not limited to:
 | * Terrorism
* Social media
* National cohesion
* Open offices
 |
| 1. Range of media for learning may include but not limited to:
 | * Mentoring
* peer support and networking
* IT and courses
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Interpersonal
* Communication
* Critical thinking
* Organizational
* Negotiation
* Monitoring
* Evaluation
* Record keeping
* Problem solving
* Decision Making
* Resource utilization
* Resource mobilization

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Company operations, procedures and standards
* Occupational Health and safety procedures
* Fundamental rights at work
* Workplace communication
* Concept of time
* Time management
* Decision making
* Types of resources
* Work planning
* Organizing work
* Monitoring and evaluation
* Record keeping
* Gender mainstreaming
* HIV and AIDS
* Drug and substance abuse
* Professional growth and development
* Technology in the workplace
* Innovation
* Emerging issues

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Conducted self-management
	2. Demonstrated interpersonal communication
	3. Demonstrated critical safe work habits
	4. Demonstrated the ability to lead a workplace team
	5. Planned and organized work
	6. Maintained professional growth and development
	7. Demonstrated workplace learning
	8. Demonstrated problem solving skills
	9. Demonstrated the ability to manage performance ethically
 |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: 1. Observation
2. Oral questioning
3. Written test
4. Portfolio of Evidence
5. Interview
6. Third party report
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On-the-job
2. Off-the –job
3. During Industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE ENVIRONMENTAL LITERACY

**UNIT CODE:** ENG/OS/AFE/BC/05/6/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate environmental literacy. It involves, controlling environmental hazard and environmental pollution, demonstrating sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/Programs , analyzing resource use and developing resource conservation plans

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Control environmental hazard
 | 1. Storage methods for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS.
2. Disposal methods of hazardous wastes are followed according to environmental regulations and OSHS.
3. ***PPE*** is used according to OSHS.
 |
| 1. Control environmental Pollution
 | * 1. Environmental pollution ***control measures*** are implemented in accordance with international protocols.
	2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999
	3. Methods for minimizing noise pollution is complied with based on Noise and Excessive Vibration Pollution and Control Regulations, 2009
 |
| 1. Demonstrate sustainable resource use
 | * 1. Methods for minimizing wastage are complied with based on organizational waste management guide
	2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)
	3. Methods for economizing and reducing resource consumption are practiced as per the Constitution of Kenya 2010 Article 69 .
 |
| 1. Evaluate current practices in relation to resource usage
 | * 1. Information on resource efficiency systems and procedures are collected and provided as per work groups/sector
	2. Current resource usage is measured and recorded as per work group
	3. Current purchasing strategies are analyzed and recorded according to industry procedures.
	4. Current work processes to access information and data is analyzed following enterprise protocol.
 |
| 1. Identify environmental legislations/conventions for environmental concerns
 | 1. Environmental legislations/conventions and local ordinances are identified according to the different environmental aspects/impact
2. Industrial standard/environmental practices are described according to the different environmental concerns
 |
| 1. Implement specific environmental programs
 | 1. Programs/Activities are identified according to organizations policies and guidelines.
2. Individual roles/responsibilities are determined and performed based on the activities identified.
3. Problems/constraints encountered are resolved in accordance with organizations’ policies and guidelines
4. Stakeholders are consulted based on company guidelines
 |
| 1. Monitor activities on Environmental protection/Programs
 | 1. Activities are periodically monitored and Evaluated according to the objectives of the environmental program
2. Feedback from stakeholders are gathered and considered in Proposing enhancements to the program based on consultations
3. Data gathered are analyzed based on Evaluation requirements
4. Recommendations are submitted based on the findings
5. Management support systems are set/established to sustain and enhance the program
6. Environmental incidents are monitored and reported to
7. concerned/proper authorities
 |
| 1. Analyze resource use
 | 1. All resource consuming processes are Identified as per the organizational work plan
2. Quantity and nature of resource consumed is determined based on processes
3. Resource flow is analyzed as per different parts of the process.
4. Wastes are classified according to NEMA regulations on waste management.
 |
| 1. Develop resource Conservation plans
 | 9.1. Efficiency of use/conversion of resources is determined according to industry protocol.9.2. Causes of low efficiency of use of resources are Determined based on industry protocol.9.3. Plans for increasing the efficiency of resource use are developed based on findings. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. PPE may include but not limited to
 | * + Mask
	+ Gloves
	+ Goggles
	+ Safety hat
	+ Overall
* Hearing protector
 |
| 1. Control measures may include but not limited to
 | * Methods for minimizing or stopping spread and ingestion of airborne particles
* Methods for minimizing or stopping spread and ingestion of gases and fumes
* Methods for minimizing or stopping spread and ingestion of liquid wastes
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Measuring
* Recording
* Analytical
* Monitoring
* Communication
* Writing

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* PPEs
* Environmental regulations
* OSHS
* Pollution
* Waste management
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Environmental hazards
* Regulatory requirements

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Controlled environmental hazard
	2. Controlled environmental pollution
	3. Demonstrated sustainable resource use
	4. Evaluated current practices in relation to resource usage
	5. Demonstrated knowledge of environmental legislations and local ordinances according to the different environmental issues /concerns.
	6. Described industrial standard environmental practices according to the different environmental issues/concerns.
	7. Resolved problems/ constraints encountered based on management standard procedures
	8. Implemented and monitored environmental practices on a periodic basis as per company guidelines
	9. Recommended solutions for the improvement of the program
	10. Monitored and reported to proper authorities any environmental incidents
 |
| 1. Resource Implications
 | The following resources should be provided:* 1. Workplace with storage facilities
	2. Tools, materials and equipment relevant to the tasks (e.g. Cleaning tools, cleaning materials, trash bags)
	3. PPE, manuals and references
	4. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection
	5. Case studies/scenarios relating to environmental Protection
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through:* 1. Observation
	2. Oral questioning
	3. Written test
	4. Portfolio of Evidence
	5. Interview
	6. Third party report
 |
| 1. Context of Assessment
 | Competency may be assessed 1. On-the-job
2. Off-the –job
3. During Industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE:** ENG/OS/AFE/BC/06/6/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risks, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify workplace hazards and risk
 | 1.1 ***Hazards*** in the workplace are identified ***based their indicators*** 1.2 Risks and hazards are evaluated based on legal requirements.1.3 ***OSH concerns*** raised by workers are addressed as per legal requirements.  |
| 1. Control OSH hazards
 | 2.1 Hazard prevention ***and control measures*** are implemented as per legal requirement.2.2 Risk assessment is conductedand a risk matrix developed based on likely impact.2.3 ***Contingency measures***, including ***emergency procedures*** during workplace ***incidents and emergencies*** are recognized and established in accordance with organization procedures. |
| 1. Implement OSH programs
 | 3.1 Company OSH program are identified, evaluated and reviewed based on legal requirements.3.2 Company OSH programs are implemented as per legal requirements.3.3 Workers are capacity built on OSH standards and procedures as per legal requirements3.4 ***OSH-related records*** are maintained as per legal requirements. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Hazards may include but not limited to:
 | * Physical hazards – impact, illumination, pressure, noise,
* vibration, extreme temperature, radiation
* Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects
* Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors
* Ergonomics
* Psychological factors – over exertion/ excessive force,

awkward/static positions, fatigue, direct pressure,* varying metabolic cycles
* Physiological factors – monotony, personal relationship, work out cycle
* Safety hazards (unsafe workplace condition) –confined space, excavations, falling objects, gas leaks, electrical, poor storage of materials and waste, spillage, waste and debris
* Unsafe workers’ act (Smoking in off-limited areas, Substance and alcohol abuse at work)
 |
| 1. Indicators may include but not limited to:
 | * Increased of incidents of accidents, injuries
* Increased occurrence of sickness or health complaints/ symptoms
* Common complaints of workers related to OSH
* High absenteeism for work-related reasons
 |
| 1. OSH concerns may include but not limited to:
 | * Workers’ experience/observance on presence of work hazards
* Unsafe/unhealthy administrative arrangements (prolonged work hours, no break time, constant overtime, scheduling of tasks)
* Reasons for compliance/non-compliance to use of PPEs or other OSH procedures/policies/guidelines
 |
| 1. Safety gears /PPE (Personal Protective Equipment) may include but not limited to:
 | * Arm/Hand guard, gloves
* Eye protection (goggles, shield)
* Hearing protection (ear muffs, ear plugs)
* Hair Net/cap/bonnet
* Hard hat
* Face protection (mask, shield)
* Apron/Gown/coverall/jump suit
* Anti-static suits
* High-visibility reflective vest
 |
| 1. Appropriate risk controls

may include but not limited to: | * Appropriate risk controls in order of impact are as follows:
* Eliminate the hazard altogether (i.e., get rid of the dangerous machine)
* Isolate the hazard from anyone who could be harmed (i.e., keep the machine in a closed room and operate it remotely; barricade an unsafe area off)
* Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)
* Use administrative controls to reduce the risk (i.e., train workers how to use equipment safely; train workers about the risks of harassment; issue signage)
* Use engineering controls to reduce the risk (i.e., attach guards to the machine to protect users)
* Use personal protective equipment (i.e., wear
* gloves and goggles when using the machine)
 |
| 1. Contingency measures may include but not limited to:
 | * Evacuation
* Isolation
* Decontamination
* (Calling designed) emergency personnel
 |
| 1. Incidents and emergencies may include but not limited to:
 | * Chemical spills
* Equipment/vehicle accidents
* Explosion
* Fire
* Gas leak
* Injury to personnel
* Structural collapse
* Toxic and/or flammable vapors emission.
 |
| 1. OSH-related Records may include but not limited to:
 | * Medical/Health records
* Incident/accident reports
* Sickness notifications/sick leave application
* OSH-related trainings obtained
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Communication
* Interpersonal
* Presentation
* Risk assessment
* Evaluation
* Critical thinking
* Problem solving
* Negotiation

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSH Principles
* Occupational hazards/risks recognition
* OSH organizations providing services on OSH evaluation and/or work environment measurements (WEM)
* National OSH regulations; company OSH policies and protocols
* Systematic gathering of OSH issues and concerns
* General OSH principles
* National OSH regulations
* Company OSH and recording protocols, procedures and policies/guidelines
* Training and/or counseling methodologies and strategies

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:1. Identified hazards in the workplace based their indicators
2. Evaluated workplace hazards based on legal requirements.
3. Addressed OSH concerns raised by workers as per legal requirements.
4. Implemented hazard prevention and control measures as per legal requirement.
5. Conducted risk assessment as per legal requirement.
6. Developed risk matrix based on likely impact.
7. Recognized and established contingency measures in accordance with organization procedures.
8. Identified, evaluated and reviewed company OSH program based on legal requirements.
9. Implemented company OSH programs as per legal requirements.
10. Capacity built workers on OSH standards and procedures as per legal requirements
11. Maintained OSH-related records as per legal requirements.
 |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: 1. Observation
2. Oral questioning
3. Written test
4. Portfolio of Evidence
5. Interview
6. Third party report
 |
| 1. Context of Assessment
 | Competency may be assessed:1. On-the-job
2. Off-the –job
3. During Industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# COMMON UNITS OF COMPETENCY

## PREPARE AND INTERPRET TECHNICAL DRAWINGS

**UNIT CODE:** ENG/OS/AFE/CC/01/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to prepare and interpret technical drawings by a Avionic technician. It involves competencies to use and maintain drawing equipment and materials, producing plain geometry drawings, solid geometry drawings, pictorial and assembly drawings, orthographic drawings of components and application of CAD software.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**  | **PERFORMANCE CRITERIA*****(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Use and maintain drawing equipment and materials
 | 1.1 ***Drawing equipment*** are identified and gathered according to task requirements1.2 ***Drawing materials*** are identified and gathered according to task requirements 1.3 Drawing equipment are used and maintained as per manufacturer’s instructions1.4 Drawing materials are used as per workplace procedures1.5 Waste materials are disposed in accordance with workplace procedures and ***environmental legislations***1.6 ***Personal Protective Equipment*** is used according to occupational safety and health regulations |
| 1. Produce plain geometry drawings
 | * 1. Different types of lines used in drawing and their meanings are identified according to standard drawing conventions
	2. Different types of ***geometric forms*** are constructed according to standard drawing conventions
	3. Different types of angles are constructed according to principles of trigonometry
	4. Different types of angles are measured using appropriate measuring tools
	5. Angles are bisected according to standard drawing conventions
 |
| 1. Produce solid geometry drawings
 | * 1. Sketches and drawings of patterns are interpreted according to standard conventions
	2. Patterns are developed in accordance with standard conventions
 |
| 1. Produce pictorial and orthographic drawings of components
 | * 1. Different symbols and abbreviations are identified and their meaning interpreted according to standard drawing conventions
	2. Isometric sketches and drawings of components are interpreted and produced in accordance with the standard conventions of isometric drawings
	3. First and third angle orthographic sketches and drawings of components are interpreted and produced in accordance with the standard conventions of orthographic drawings
	4. Freehand sketching of different types of geometric forms, tools, equipment, diagrams and components is conducted
 |
| 1. Produce assembly drawings
 | * 1. Orthographic views are exploded according to standard conventions of orthographic drawings.
	2. Pictorial views are exploded according to standard conventions of orthographic drawings.
	3. Part lists are identified according to part to be produced
	4. Sectional views are produced according to standard conventions of drawing.
	5. Produced drawing is hatched according to standard conventions of drawings.
 |
| 1. Apply CAD packages in drawing
 | * 1. CAD packages are selected according to task requirements
	2. CAD packages are applied in production ofengine parts, electrical and electronic circuits and vehicle body parts drawings
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria

apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Drawing equipment may include but not limited to:
 | * Drawing boards
* T-square
* Set squares
* Drawing set
* Computers with CAD packages
 |
| 1. Drawing materials may include but not limited to:
 | * Drawing papers
* Pencils
* Erasers
* Masking tapes
* Paper clips
 |
| 1. Environmental legislations may include but not limited to:
 | * EMCA 1999
 |
| 1. Personal Protective Equipment may include but not limited to:
 | * Dust coats
* Closed leather shoes
* Goggles for CAD
 |
| 1. Geometric forms may include but not limited to:
 | * Circles
* Triangles
* Rectangles
* Parallelogram
* Polygons
* Pyramids
* Conic sections
* Prisms
* Loci
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required skills**

The individual needs to demonstrate the following skills:

* Critical thinking
* Drawing
* Interpretation
* Drawing equipment handling
* Analysis and synthesis
* Communication
* Inter personal

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Drawing equipment and materials
* Freehand sketching
* Lettering
* Geometrical constructions
* Types of drawings
* Types of lines
* Isometric drawing conventions, features, characteristics, components
* Orthographic drawing conventions, features, characteristics, components
* Sketches and drawings of simple patterns

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate:* 1. Applied and adhered to safety procedures
	2. Cared and maintained drawing equipment
	3. Interpreted circuit, assembly and lay out diagrams
	4. Applied appropriate technical standards, used proper tools and equipment for a given task
	5. Produced sketches and drawings
	6. Applied CAD packages in production of drawings
 |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency may be assessed through:* 1. Practical tests
	2. Observation
 |
| 1. Context of Assessment
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

##

## APPLY ENGINEERING MATHEMATICS

**UNIT CODE: ENG/OS/AFE/CC/02/6/A**

**UNIT DESCRIPTION**

This unit describes the competencies required by a Mechatronics Engineering technician to apply a wide range of engineering mathematics in their work. This includes: applying algebraic functions, trigonometry and hyperbolic functions, complex numbers, coordinate geometry, carrying out binomial expansion, calculus, ordinary differential equations, Laplace transforms, power series, Statistics, Fourier series, Vector theory, Matrix, Numerical methods, probability, commercial calculations, estimations, measurements and calculations of quantities in solving problems.

|  |  |
| --- | --- |
| **ELEMENTS AND PERFORMANCE CRITERIAELEMENT** These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range.*** |
| * 1. Apply Algebra
 | 1. Calculations involving Indices are performed as per the concept
2. Calculations involving Logarithms are performed as per the concept
3. Scientific calculator is used in solving mathematical problems in line with manufacturer’s manual
4. Simultaneous equations are performed as per the rules
5. Quadratic equations are calculated as per the concept
6. Arithmetic and geometric progression problems are solved
 |
| * 1. Apply Trigonometry and hyperbolic functions
 | 1. Calculations are performed using trigonometric rules
2. Calculations are performed using ***hyperbolic functions***
 |
| * 1. Apply complex numbers
 | * 1. Complex numbers are represented using Argand diagrams
	2. Operations involving complex numbers are performed
	3. Calculations involving complex numbers are performed using De Moivre’s theorem
 |
| 1. Apply Coordinate Geometry
 | * 1. Polar equations are calculated using coordinate geometry
	2. Graphs of given polar equations are drawn using the Cartesian plane
	3. Normal and tangents are determined using coordinate geometry
	4. Loci of points are determined for given mechanism
 |
| 1. Carry out Binomial Expansion
 | * 1. Roots of numbers are determined using binomial theorem
	2. Errors of small changes are determined using binomial theorem
	3. Power series are derived through Binomial expansion
 |
| 1. Apply Calculus
 | * 1. Derivatives of functions are determined using Differentiation
	2. Derivatives of hyperbolic functions are determined using Differentiation
	3. Derivatives of inverse trigonometric functions are determined using Differentiation
	4. Rate of change and small change are determined using Differentiation.
	5. Calculation involving stationery points of functions of two variables are performed using differentiation.
	6. Integrals of algebraic functions are determined using integration
	7. Integrals of trigonometric functions are determined using integration
	8. Integrals of logarithmic functions are determined using integration
	9. Integrals of hyperbolic and inverse functions are determined using integration
 |
| 1. Solve Ordinary differential equations
 | * 1. First order and second order differential equations are formed.
	2. First order and second order differential equations are solved using the method of undetermined coefficients
	3. First order and second order differential equations are solved from given boundary conditions
 |
| 1. Apply Laplace transforms
 | * 1. Laplace transforms are solved using initial and final value theorems
	2. Inverse Laplace transforms are solved using partial fractions
	3. Differential equations are solved using Laplace transforms
 |
| 1. Apply Power Series
 | * 1. Power series are obtained using Taylor’s Theorem
	2. Power series are obtained using Maclaurin’s theorem
 |
| 1. Apply Statistics
 | 1. Identification, Collection and Organization of data is performed
2. Interpretation, analysis and presentation of data in appropriate format is performed
3. Mean, median, mode and Standard deviation are obtained from given data
 |
| 1. Apply Fourier Series
 | * 1. Fourier series coefficients are obtained using Fourier series techniques
	2. Fourier series for 2π to T is are obtained using Fourier series techniques
	3. Fourier series for odd and even functions are obtained using Fourier series techniques
	4. Harmonic analysis is performed using numerical methods
 |
| 12.Apply Vector theory | * 1. Calculations involving vector algebra, dot and cross products using vector theory
	2. Gradient, Divergence and Curl are obtained
	3. Vector calculations are performed using Green’s theorem
	4. Vector calculations are performed using Stoke’s theorem
	5. Conservative vector fields and line and surface integrals are obtained using Gauss’s theorem
 |
| 1. Apply Matrix
 | * 1. Determinant and inverse of 3x3 matrix are obtained
	2. Solutions of simultaneous equations are obtained
	3. Calculation involving Eigen values and Eigen vectors are performed
 |
| 1. Apply Numerical methods
 | * 1. Roots of polynomials are obtained using iterative numerical methods
	2. Interpolation and extrapolation are performed using numerical methods
 |
| 1. Apply concepts of probability for work
 | * 1. Calculations are performed based on Laws of probability
	2. Calculation involving probability distributions, mathematical expectation sampling distributions are performed
	3. Probability events are determined from dependent, independent and mutually exclusive
	4. Counting is done using permutation, combination, tree diagrams and Venn diagrams techniques
 |
| 1. Perform commercial calculations
 | * 1. Exchange rate calculations are done using devaluation and revaluation
	2. Sales, stock turnover and profit and loss are determined
	3. Incomes, salaries and wages are calculated
 |
| 1. Perform estimations, measurements and calculations of quantities
 | * 1. Measurement information in workplace is extracted and interpreted
	2. Appropriate workplace measuring tools and equipment are identified and selected
	3. Conversions are performed between units of measurement
	4. Measurements are estimated and taken
	5. Length, width, height, perimeter, area and angles of ***figures*** are calculated
	6. Volume and surface area of figures are calculated
	7. Information is recorded using mathematical language and symbols appropriate for the task
 |

 **RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range**  |
| 1. Hyperbolic functions may include but not limited to:
 | * + Sinh x
	+ Cosh x
	+ Cosec x
	+ Coth x
	+ Tanh x
	+ Sech x
 |
| 1. Figures may include but not limited to:
 | * + Triangles
	+ Squares
	+ Rectangles
	+ Circles
	+ Spheres
	+ Cylinders
	+ Cubes
	+ Polygons
	+ Cuboids
	+ Pyramids
 |
| 1. Quantities may include but not limited to:
 | * + Weight,
	+ Mass
	+ Area
	+ Volume
	+ Length
	+ Width
	+ Depth
	+ Perimeter
 |

**REQUIRED SKILLS AND KNOWLEDGE**

 This section describes the skills and knowledge required for this unit of competency.

 **Required Skills**

 The individual needs to demonstrate the following skills:

* Applying fundamental operations (addition, subtraction, division, multiplication)
* Using and applying mathematical formulas
* Logical thinking
* Problem solving
* Applying statistics
* Drawing graphs
* Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Fundamental operations (addition, subtraction, division, multiplication)
* Calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Rounding techniques
* Types of fractions
* Types of tables and graphs
* Presentation of data in tables and graphs
* Vector operations
* Matrix operations

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills, knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate: * 1. Applied Trigonometry and hyperbolic functions
	2. Applied complex numbers
	3. Determined angles and length in triangles
	4. Applied Calculus
	5. Solved Ordinary differential equations
	6. Applied Laplace transforms
	7. Applied Power Series
	8. Applied Fourier Series
	9. Applied Vector theory
	10. Applied Matrix

1.11 Identified and selected measuring equipment 1.12 Collected, Analyzed and presented data1.13 Applied Numerical methods |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: * 1. Direct Observation
	2. Demonstration with Oral Questioning
	3. Written tests
 |
| 1. Context of Assessment
 |  Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## APPLY AERODYNAMICS PRINCIPLES

**UNIT CODE:** ENG/OS/AFE/CC/03/6/A

**UNIT DESCRIPTION:**

This unit describes the competencies required by a technician to apply aerodynamics principles. It involves uunderstanding atmosphere, applying basic aerodynamics in relation to an aircraft in flight, applying principles of the theory of flight of an aircraft, and applying static and dynamic stability of an aircraft in flight.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.*Bold and italicized terms are elaborated in the Range.* |
| --- | --- |
| 1. Understand atmosphere
 | * 1. The ***composition of air*** in the atmosphere is studied
	2. How atmosphere is split into different layers.
	3. ***Atmospheric conditions*** within the different layers and how change is studied.
	4. International Standard Atmosphere is established, its values and how it is used to assist aircraft in flight.
	5. Working of aircraft pressure altimeter and airspeed indicator works along with the different types of airspeeds is studied.
 |
| 1. Apply basic aerodynamics in relation to an aircraft in flight.
 | * 1. Pressure in flight is distribution around an aerofoil surface along with the different types of airflow over an aircraft’s surface both laminar and turbulent and how its boundary layer is formed.
	2. The generation of lift and drag and how the movement of a surfaces centre of pressure and change in angle of attack affect the amount of lift or drag generated.
	3. How the shape of a wing its camber, chord and washout along with its fineness and aspect ratio and aerofoil contamination affect the aerodynamic performance of an aerofoil in producing both lift and drag.
	4. The stalling of an aircraft in flight and the relationship between the thrust, weight and aerodynamic resultant along with the aerodynamic couples of lifts, weight, thrust and drag
 |
| 1. Apply principles of the theory of flight of an aircraft.
 | * 1. The steady state performance of an aircraft in level flight and the changes required that have to be made to maintain it.
	2. How the different forces act on an aircraft in a turn and the corrections that must be made to maintain a level and steady turn.
	3. The climbing and gliding performance of an aircraft, its glide and climb ratio and how their rates and ability are changed.
	4. The flight envelope of an aircraft, the reasons for its limits with regards to an aircraft structural limitations and safety and how different manoeuvres and changes in load factor affect both the safety and structural limits of the envelope.
 |
| 1. Apply static and dynamic stability of an aircraft in flight
 | * 1. The definition of positive, negative and neutral stability.
	2. The passive stability of an aircraft about its longitudinal, lateral and directional axis’s and the control surfaces that affect the aircrafts longitudinal, lateral and directional stability.
	3. The active stability of an aircraft in flight about its longitudinal, lateral and directional axis’s.
	4. How spiral instability and Dutch roll occurs and the effect of weather cocking on an aircraft’s directional stability.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Composition of air may include but not limited to:
 | * + Oxygen
	+ Carbon dioxide
	+ Nitrogen
 |
| 1. Atmospheric conditionsmay include but not limited to:
 | * + Pressure,
	+ Density,
	+ Temperature
	+ Humidity
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* International standard atmosphere
* Atmospheric instruments used within an aircraft
* Pressure distribution around an aerofoil surface
* Boundary layer, laminar and turbulent airflow
* Wing camber, chord, shape and washout
* Generation of lift and drag
* Centre of pressure and angle of attack
* Fineness and aspect ratio
* Aerofoil contamination
* Stalling in flight
* Steady state flight performance
* Climb performance
* Gliding performance
* Load factor, flight envelope and structural limitations
* Lift augmentation
* Passive stability about the longitudinal, lateral and directional axes of an aircraft
* Active stability of an aircraft in flight

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Composition of the atmosphere and its layers
* Pressure, density, temperature and humidity
* International standard atmosphere
* Atmospheric instruments used within an aircraft
* Pressure distribution around an aerofoil surface
* Boundary layer, laminar and turbulent airflow
* Wing camber, chord, shape and washout
* Generation of lift and drag
* Centre of pressure and angle of attack
* Fineness and aspect ratio
* Relationship between thrust, weight and aerodynamic resultant
* Aerofoil contamination
* Relationship between lift, weight, thrust and drag
* Stalling in flight
* Steady state flight performance
* Climb performance
* Gliding performance
* Theory of forces in a turn
* Load factor, flight envelope and structural limitations
* Lift augmentation
* Passive stability about the longitudinal, lateral and directional axes of an aircraft
* Active stability of an aircraft in flight

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical aspects of Competency
 | Assessment requires evidence that the candidate: 1. Understood atmosphere
2. Applied basic aerodynamics in relation to an aircraft in flight.
3. Applied principles of the theory of flight of an aircraft.
4. Applied static and dynamic stability of an aircraft in flight
 |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Competency in this unit may be assessed through: * 1. Direct Observation
	2. Demonstration with Oral Questioning
	3. Written tests
 |
| 1. Context of Assessment
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## PERFORM WORKSHOP PROCESSES AND PRACTICES

**UNIT CODE:** ENG/OS/AFE/CC/04/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by avionic technician in order to apply a wide range of workshop processes and practice skills in their work. It involves use of different methods to produce work pieces using basic tools while observing occupational safety and health legislations, regulations and safe working practices, interpret working drawings, select appropriate techniques for a given task to achieve specified results, assemble of metal parts and sub-assemblies as well as perform housekeeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***Bold and italicized terms are elaborated in the Range*** |
| --- | --- |
| 1. Use technical drawing to plan work operations
 | * 1. Technical drawings are produced ***as*** per ***drawing standards***
	2. Technical drawings and geometric symbols are read and interpreted as per drawing standards.
	3. ***Operation plan*** is produced as per the technical drawings.
 |
| 1. Measure and mark out dimensions on work pieces
 | * 1. Measuring tools suitable for the work are selected according to task description
	2. Measuring tools are inspected and calibrated as per requirements
	3. Dimensions are marked on the work piece as per the working drawing.
 |
| 1. Use hand tools to cut and file parts
 | * 1. ***Hand tools*** are selected based on operation plan
	2. Work piece is cut to specification based on job requirement
	3. Work piece is filed to specification based on job requirement
	4. Part are produced to ***specifications*** based on work requirement
 |
| 1. Use drills to make holes
 | * 1. Hole centers are marked and center-punched as per operation plan.
	2. Drill bits are selected and mounted according to work requirements
	3. Work piece is mounted and clamped according to workshop regulations
	4. Hole is drilled to specification according to work requirements
	5. Holes inspected to specification according to work requirements
 |
| 1. Thread using taps and dies
 | * 1. Taps and dies selected based on operation plan.
	2. Taps and dies are set up on the work piece according to work specifications
	3. Work piece is clamped according to work requirements
	4. ***Threads*** are cut according to work specifications
 |
| 1. Assemble metal parts and sub-assemblies
 | * 1. ***Joining and assembly method*** is selected according to work requirements
	2. Parts joined, fitted and assembled according to the specified assembly and joinery methods
	3. Final assembly is inspected as per specification
 |
| 1. Perform housekeeping
 | * 1. Waste is segregated and disposed as per disposal guidelines.
	2. Housekeeping is carried out as per workplace requirement
	3. Tools and equipment are stored in accordance to manufacturer requirement
 |
| 1. Inspect finished work for accuracy and quality
 | * 1. Inspection tools and methods are selected as per operation plan
	2. Finished work is inspected as per specification
	3. Adjustments are made based on inspections results
 |
| 1. Maintenance of tools and equipment
 | * 1. Machines and tools are inspected in accordance to manufacturer specifications
	2. Machines and tools are lubricated according to manufacturer manual
	3. Tools are ground to manufacturer specification
	4. Faults on machines and tools are identified and reported according to maintenance manual
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **VARIABLE** | **RANGE** |
| --- | --- |
| 1. Drawing Standards may include but not limited to:
 | * + ISO
	+ BS
	+ ANSI
 |
| 1. Operation Plan may include but not limited to:
 | * + Sequence of operations
	+ Measuring tools
	+ Hand tools
	+ Cutting tools
	+ Inspection tools
 |
| 1. Hand tools may include but not limited to:
 | * + Files
	+ Saws
	+ Hammers
	+ Chisels
	+ Taps and dies
 |
| 1. Specifications may include but not limited to:
 | * + Dimensions
	+ Tolerances
	+ Geometry
	+ Surface finish
	+ Functionality
 |
| 1. Threads may include but not limited to:
 | * + Internal and external threads
	+ V-profile threads
 |
| 1. Joining and assembly method may include but not limited to:
 | * + Riveting
	+ Fastening
	+ Soldering
	+ Brazing
	+ Welding
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate the following skills:

* Technical drawing
* Using measuring and inspection tools
* Using hand tools
* Using portable and bench drilling machines
* Soldering and brazing
* Riveting and fastening
* Use of the lathe machine
* Use of milling machine
* Using grinding machine

**Required Knowledge**

The individual needs to demonstrate knowledge and understanding of:

* Occupational Health and Safety Act of Kenya laws 2007 with focus on personal safety, machine safety and workplace
* National Environment Management Authority Act, Kenya 2004
* OSH act
* Equipment manuals
* Basic technical drawing complyingto ISO, ANSI & BS standards
* ISO 1101 Geometrical tolerance and where to use the norm
* Work Planning and documentation
* Measuring tools
* Hand tools
* Bench work
* Portable and bench drilling machines
* Lathe machine
* Grinding machine
* Inspection and quality control
* Preventive maintenance of machine tools
* Metal cutting technology
* Materials and metallurgy
* WIBA Act (2007)
* Report writing

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency
 | Assessment requires evidence that the candidate :* 1. Observed rules and procedures in the workshop
	2. Interpreted technical drawing
	3. Produced operation plan
	4. Produced holes on a work piece
	5. Threaded using taps and dies
	6. Assembled metal parts
	7. Surface finished work piece
	8. Maintained tools and equipment
	9. Did housekeeping before, during and after operations
 |
| 1. Resource Implications
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment
 | Co Competency may be assessed through:* 1. Observing the behaviour of the learner
	2. Oral presentations
	3. Inspection of written operation procedures
	4. Inspection of finished product
	5. Observing housekeeping of the work area and/or machine tool
 |
| 1. Context of Assessment
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CORE UNITS OF COMPETENCY

## PRODUCE AIRFRAME

**UNIT CODE:** ENG/OS/AFE/CR/01/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to produce airframes. It involves marking out aircraft components, cutting and shaping aircraft components, bending and forming aircraft components, carrying out joining process, producing aircraft assemblies, installing aircraft controls, testing aircraft and its components and maintaining airframe and structures.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Mark out aircraft components
 | * 1. Work safety measures are adhered to according to OSHA and design precautions
	2. Marking space is prepared according to work requirements
	3. Components drawings are analysed according to manual specifications
	4. ***Aircraft component materials*** are identified according to design requirement.
	5. ***Measuring and marking tools*** are identified according to task requirements
	6. Aircraft components are marked out according to work requirements
 |
| 1. Cut and shape aircraft components
 | * 1. Work safety measures are adhered to according to OSHA and design precautions
	2. ***Cutting method*** is selected according to work specifications and component material
	3. Cutting equipment and tools are prepared according to work requirements
	4. ***Major components and minor components*** are cut according to specifications
	5. ***Shaping method*** is selected according to work requirements
	6. Aircraft components are shaped according to work requirements
 |
| 1. Bend and form aircraft components
 | * 1. Work safety measures are adhered to according to OSHA and design precautions.
	2. Components technical drawings are analysed according to work requirements
	3. Bending and forming machines are prepared according to work requirements
	4. Aircraft components are bent according to work requirements
	5. Aircraft components are formed according to work requirements
	6. Quality checks are carried out at suitable intervals according to work requirements
 |
| 1. Carry out joining process
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Mechanical joiningtechnical drawing is analyzed and work planned appropriately according to work requirement
	3. ***Appropriate tools and equipment*** for the installation operations are obtained and checked that they are in a safe and usable condition according to operation manual
	4. Components are joined and secured using the appropriate joining techniques
	5. Dimensional and geometrical aspects of the components are measured and checked according to the specification.
 |
| 1. Produce aircraft assemblies
 | 1. Work safety is observed and adhered to according to health and safety legislation and regulations
2. Aircraft assembly production activities are planned according to wok requirements
3. Appropriate work tools and equipment for the aircraft assembly production are obtained and check that they are in a safe and usable condition according to user manual
4. The specified components are obtained and checked that they are in a usable condition according to design specification
5. Appropriate methods and techniques to assemble the components in their correct positions are selected as per design
6. Components are secured appropriately using the specified connectors and securing devices
7. Dimensional and geometrical aspects of the component are measured and checked to the specification
8. Completed assembly is checked to ensure that all operations have been completed and that the finished assembly meets the required specification
 |
| 1. Install aircraft controls
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Required electronic equipment are installed according to prescribed method of operation and installation manual.
	3. Monitoring and control systems are installed according to installation manuals
	4. ***Control devices*** are tested according to system functionality
 |
| 1. Test aircraft and its components
 | * 1. Aircraft and system are prepared in accordance with applicable maintenance manual for the application of power/system operation
	2. Airframe system is functionally tested in accordance with maintenance manual for evidence of serviceability or malfunction
	3. System adjustment/rigging is performed in accordance with maintenance manual
 |
| 1. Maintain airframe and structures
 | * 1. Routine servicing check on an air frame and structures is carried out in accordance with an approved maintenance schedule.
	2. Inspection of aircraft components using precision measuring equipment and Non-Destructive Inspection (NDI) techniques is carried out in accordance with the prescribed procedure.
	3. Aircraft structural repair is carried out in accordance with the appropriate structural repair manual or servicing procedure.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Aircraft component materials may include but not limited to:
 | * Composites
* Aluminium
* Titanium
* Steel
 |
| 1. Measuring and marking tools may include but not limited to:
 | * Marking knife
* Pencils
* Dial calliper
* Marking gauge
* Bevel gauge
* Scratch awl
 |
| 1. Cutting method may include but not limited to:
 | * Water jet cutting
* Diamond saw cutting
* Air jet cutting
* Plasma arc
* Lathe machining
 |
| 1. Major components may include but not limited to:
 | * Fuselage
* Stabilizer
* Elevator
* Fin
* Rudder
 |
| 1. Minor components may include but not limited to:
 | * Rackets
* Clips
 |
| 1. Shaping method may include but not limited to:
 | * Robotic End Effectors Trimming method
* Shaping machine
* Special Trimming Heads and Catchers
 |
| 1. Appropriate tools and equipment may include but not limited to:
 | * Riveting guns (appropriate to rivet type)
* Gripping pins and location dowels
* Gauges for intrusions
* Redline templates
* Clamps
* Drills and tools with attachments
* Jigs
 |
| 1. Control devices may include but not limited to:
 | * Contactors
* Motor starters
* Valves
* Sensors
* Processors and microprocessors
* Camera
* Transducers
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in***:***

* Communication skills
* Problem solving
* Creativity and innovation
* Data collection and analysis
* Use of tools and equipment
* Technical presentation
* Technical drawing
* Troubleshooting
* Operation Monitoring
* Using hand skills, tools and test equipment in the testing, adjustment and troubleshooting of airframe systems and components, including airframe system component removal and installation
* Recognizing system and component defects/external damage, correct installation and security for the range of airframe systems listed in the range of conditions
* Removing, installing and rigging of flight controls
* Checking flight control mass balance
* Performing system functional tests and checks to isolate system faults and assess post-maintenance serviceability
* Effectively using maintenance documentation and relevant fault diagnosis guides in the troubleshooting process and for component removal and installation
* Applying standard procedures

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Measuring techniques
* Joining processes
* Technical drawing
* Locking devices
* PPE
* Material identification and selection
* Inspection techniques
* Defect recording procedures
* Tools and equipment
* Evaluation
* Understanding basic aircraft systems
* Hazards in airframe installation
* Problem solving
* Maintenance scheduling
* Interpretation of technical drawings
* Documentation
* Types of tools and equipment
* Properties of materials
* Electrical and mechanical machine drives
* Relevant maintenance manuals
* Relevant regulatory requirements and standard procedures.

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Marked out aircraft components
	2. Cut and shaped aircraft components
	3. Bend and formed aircraft components
	4. Carried out joining of aircraft components
	5. Produced aircraft assemblies
	6. Installed aircraft controls
	7. Maintained airframe systems and structures
	8. Followed aviation regulatory requirements
	9. Used Personal protective equipment
	10. Used guidance manuals
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## MAINTAIN AIRCRAFT INTERIOR, EQUIPMENT AND FURNISHING

**UNIT CODE:** ENG/OS/AFE/CR/02/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to carry out aircraft interior soft furnishing. It involves installing aircraft lockers and storage units, cutting and shaping furnishings, installing interior panels and soft furnishings, installing aircraft seating and furniture, aircraft lavatory and galley, aircraft emergency equipment and aircraft stretcher

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Install aircraft lockers and storage units
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Appropriate work tools and equipment production are obtained and check that they are in a safe and usable condition according to user manual
	3. The specified components are obtained and checked that they are in a usable condition according to design specification
	4. Aircraft lockers and storage units are installed using the specified securing devices
	5. Dimensional and geometrical aspects of the component are measured and checked to the specification
	6. Completed assembly is checked and tested to ensure that all installation and operations have been completed and that the finished assembly meets the required specification
 |
| 1. Cut and shape furnishings
 | * 1. Marking out and cutting of the material so as to minimise waste is planned according to work requirements
	2. Marked components are correctly aligned on the material, taking account of pattern matching when appropriate
	3. Major flaws are removed from marked components and any minor defects are minimized according to specifications
	4. Soft furnishings are marked out accurately, clearly and to within acceptable tolerance limits according to design specifications
	5. Materials are cut cleanly and accurately according to the given size and shape tolerances
	6. Templates and lays are removed and checked that they are free from damage before storing over for future use
	7. Components are prepared according to the specification and confirmed that they are ready for the next stage in the process
	8. Components are protected from damage while they are being handled and passed on to the next stage
	9. Left over material and wastes are moved into the designated locations according specifications
	10. Complete components are recorded and stored properly according to manual
 |
| 1. Install interior panels and soft furnishings
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Technical drawings and specifications for the installation being carried out are interpreted according to installation manual
	3. ***Tools and equipment*** for the installation operations are selected and checked that they are in a safe and usable condition according to the manual
	4. Equipment and components are installed, positioned and secured in accordance with the specification
	5. Connections to the equipment are checked and verified that are complete according to specifications
 |
| 1. Install aircraft seating and furniture
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Installation tools and equipment are selected and checked to be in usable condition according to manual
	3. Installation manual is analysed according to work requirements
	4. Components are positioned and installed according to installation manual
	5. Connections to the components are checked to ensure they are properly secured according to installation manual
 |
| 1. Install aircraft lavatory and galley
 | 1. Work safety is observed and adhered to according to health and safety legislation and regulations
2. Installation tools and equipment are selected and checked to be in usable condition according to manual
3. Installation manual is analysed according to work requirements
4. Aircraft lavatories and galley are installed and positioned according to installation manual
5. Connections to the components are checked to ensure are properly secured according to installation manual
6. Aircraft lavatories and galley are tested according to aircraft maintenance manuals
 |
| 1. Install aircraft emergency equipment
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Installation tools and equipment are selected and checked to be in usable condition according to manual
	3. Installation manual is analysed according to work requirements
	4. Aircraft emergency equipment are checked for fitness and usability according to manual.
	5. ***Aircraft emergency equipment*** are installed and positioned according to installation manual
	6. Connections to the components are checked to ensure are properly secured according to installation manual
	7. Aircraft emergency equipment are tested according to aircraft maintenance manuals
 |
| 1. Install aircraft stretcher
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Installation tools and equipment are selected and checked to be in usable condition according to manual
	3. Installation manual is analysed according to work requirements
	4. Aircraft stretcheris installed and positioned according to installation manual
	5. Connections to the components are checked to ensure they are properly secured according to installation manual.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Tools and equipment may include but not limited to:
 | * Hand tools
* Power tools
* Machines
 |
| 1. Aircraft emergency equipment may include but not limited to:
 | * Escape slide
* Life vest
* First aid kit
* Smoke hood
* Fire extinguisher
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Communication skills
* Problem solving
* Creativity and innovation
* Data collection and analysis
* Use of tools and equipment
* Technical presentation
* Technical drawing
* Installation and fabrication

 **Required Knowledge**

The individual needs to demonstrate knowledge of:

* safety practices and procedures
* PPE
* Seating and furnishings terminologies
* Joining methods and techniques
* Quality control procedures
* Tools and equipment
* Interior design
* Material handling
* Seals, sealant and adhesives
* Fitting defects
* Problem solving
* Data analysis and interpretation
* Interpretation of technical drawings
* Documentation
* Properties of materials
* Testing and inspection
* Aircraft interior configuration document (LOPA)

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Installed aircraft lockers and storage units
	2. Cut and shaped soft furnishings
	3. Installed interior panels and soft furnishings
	4. Installed aircraft seating and furniture
	5. Installed aircraft lavatories
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

**MAINTAIN AIRCARAFT POWERPLANT**

**UNIT CODE:** ENG/OS/AFE/CR/03/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to maintain aircraft power plant. It involves troubleshooting aircraft engine condition, removing and installing aircraft engine, servicing aircraft engine components, servicing and installing engine accessories and auxiliary components, testing aircraft engine and preserving/depreserving aircraft engine.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Troubleshoot aircraft engine condition
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Aircraft engine technical drawing is interpreted according to system requirements
	3. Tools and equipment are identified according to system requirements
	4. Aircraft engine fault is identified and classified according to recommended steps/procedures in the service manual
	5. Repair criteria is determined per the engine manual
 |
| 1. Remove and install aircraft engine
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Site is cleaned and organised according to SOPS
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Aircraft engine is repaired where applicable according to troubleshooting findings and engine manuals
	5. Engine is disassembled and parts stored safely according to required procedures, where applicable
	6. ***Worn out parts*** are identified according to system manual
	7. Engine is inspected according to manufacturer’s recommendation
	8. Parts are cleaned and prepared according to work requirements
	9. Engine is re-assembled according to design manual
	10. Worn out parts are replaced according to design manual
	11. Engine is tested according to operating parameters
	12. Serviced aircraft engine is installed to the aircraft according to aircraft maintenance manuals.
	13. Installed aircraft engine is tested in accordance with aircraft maintenance manuals (AMM)
 |
| 1. Service aircraft engine components
 | * 1. Tools and equipment are operated correctly according to manufacturer specifications.
	2. Engine is serviced according manufacturer specifications.
	3. ***Faulty components*** are repaired/replaced according to the service manual and specifications
	4. Replaced components are re-assembled according to manufacturer’s manual.
	5. Serviced/repaired aircraft engine is tested according to maintenance manual.
	6. Engine faults and/or repairs are documented according to SOPs
 |
| 1. Service and install engine accessories and auxiliary components
 | * 1. Tools and equipment are operated correctly according to manufacturer specifications
	2. ***Faulty engine accessories and auxiliary components*** are identified and repaired/replaced according to the service manual and specifications
	3. Repaired/ replaced engine accessories are tested according to maintenance manual.
	4. Faults and/or repairs are documented according to SOPs
 |
| 1. Test aircraft engine
 | * 1. Aircraft engine is tested for functionality according to system specifications
	2. Monitoring, evaluation and assessment of the engine performance is done according to the system functionality
	3. Performance parameters are recorded according to maintenance manuals and SOPs.
	4. Aircraft is restored to normalcy in accordance with aircraft maintenance manual.
	5. System commissioning is done according to the prescribed user specifications
 |
| 1. Preserve/depreserve aircraft engine
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Tools and equipment are identified and used according to operation manual
	3. Aircraft engine accessories and auxiliary components are identified and reserved/depreserved according to the service manual and specifications.
	4. Job done is documented according to organizational procedures and engine tagged accordingly.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Worn out parts may include but not limited to:
 | * Bearings
* Shaft
* Blades
* Rotating disks
* Rings and seals
* Vanes
 |
| 1. Faulty components may include but not limited to:
 | * Gears
* Bearings
* Drive shafts
* Instruments
* Electrical wiring/ harnesses
* Mechanical linkages
* Valves
 |
| 1. Faulty engine accessories and auxiliary components may include but not limited to:
 | * Bulkheads
* Line clamps
* Ignitors and exciters
* Fuel metering unit/ hydro mechanical unit
* Fuel and oil pump
* Heat exchanger
* Fuel and oil filters
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**REQUIRED SKILLS**

***The individual needs to demonstrate skills in:***

* Communication skills
* Problem solving
* Data collection and analysis
* Use of tools and equipment
* Technical drawing
* Service and repair of system components
* Fault diagnosis
* Interpretation of circuit
* Basics on mechanical installation
* Use of test and measuring instruments
* Planning
* Organisation

**Required Knowledge**

The individual needs to demonstrate knowledge of***:***

* Technical report writing
* PPE
* Interpretation of technical drawings
* Documentation
* Types of tools and equipment
* Electrical and mechanical machine drives
* Machine operation
* Types of maintenance
* Manual interpretation
* Scheduling/planning for maintenance

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Did troubleshoot aircraft engine condition
	2. Did overhaul aircraft engine
	3. Serviced and re-assembled aircraft engine components
	4. Serviced and installed engine accessories and auxiliary components
	5. Tested aircraft engine
	6. Preserved/ depreserved aircraft engine
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | ***Competency may be assessed through:**** 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## MAINTAIN AIRCRAFT HYDRAULIC SYSTEM

**UNIT CODE**: ENG/OS/AFE/CR/04/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to maintain aircraft hydraulic system. It involves troubleshooting aircraft hydraulic system, removing aircraft hydraulic components, servicing/ repairing aircraft hydraulic components, fitting/replacing aircraft hydraulic components, installing aircraft hydraulic system and testing aircraft hydraulic system.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Troubleshoot aircraft hydraulic system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Hydraulic system manual is interpreted according to system requirements
	3. Tools and equipment are identified according to system requirements
	4. Hydraulic system fault is identified and classified according to recommended steps/procedures in the service manual
	5. Troubleshooting findings are recorded according to SOPs.
 |
| 1. Remove aircraft hydraulic components
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. ***Hydraulic components*** are detached from system according to work requirements
	5. Detached hydraulic components are cleaned and stored according to manufacturer’s specifications
 |
| 1. Service/ repair aircraft hydraulic components and system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Components/systems are serviced according to the service manual and specifications
	5. Faulty hydraulic components are repaired according to service manual.
	6. Serviced/repaired aircraft hydraulic components are tested according to aircraft component manuals (CMM)
	7. System service and/or repairs are documented according to SOPs
 |
| 1. Fit/replace aircraft hydraulic components
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Faulty hydraulic components are replaced according to service manual
 |
| 1. Install aircraft hydraulic system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Installation manuals are interpreted according to SOPs
	3. Hydraulic system components are identified according installation manual
	4. System components layout is done according to installation manual
	5. Tools and equipment are selected and checked to be in usable condition according to user manual
	6. Hydraulic system is installed according to installation manual
	7. Hydraulic system is tested according to applicable maintenance manuals.
 |
| 1. Test aircraft hydraulic system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations and manual precautions.
	2. ***Peripheral devices*** are verified if they are properly connected according aircraft maintenance manual
	3. Peripheral devices functionality is tested according to manufacturer’s manual
	4. Hydraulic oil ***validity*** is verified according prescribed procedures
	5. Hydraulic oil leakages are checked according to prescribed oil leakage checking methods and aircraft specifications
	6. Testing equipment are selected and operated correctly according to manufacturer’s specifications
	7. Hydraulic system is tested according to aircraft manufacturer manual
	8. Aircraft is restored to normalcy in accordance with aircraft maintenance manual.
	9. Aircraft hydraulic system service work is documented according to organizational procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Hydraulic components may include but not limited to:
 | * Reservoir
* Pump
* Actuator
* Filters
* Valves
* Pressure gauge
 |
| 1. Peripheral devices may include but not limited to:
 | * Pipes/tubes/hoses
* Gauges
* Valves
* Instruments
* Sensors
* Pumps
* Reservoirs
* Compressors
* Regulators
* Filters
* Seals
* Power units
 |
| 1. Validity may include but not limited to:
 | * Pressure
* Temperature
* Contamination/impurities
* Viscosity
* Density
* Fluid life cycle
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Communication skills
* Problem solving
* Creativity and innovation
* Data collection and analysis
* Use of tools and equipment
* Technical presentation
* Technical drawing
* Installation
* Interpretation of installation manuals
* Service and maintenance

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Pascal principle
* Hydraulic fluids
* Hydraulic power generation
* Emergency generation of hydraulic power
* Force; pressure; area; differential areas
* Fluid requirements: properties; types; identification; hazards
* Power generation methods — main system; emergency standby system
* Technical report writing
* Hydraulic connectors and fittings
* Data analysis and interpretation
* Interpretation of technical drawings
* Documentation
* Types of tools and equipment
* Electrical and mechanical machine drives
* Testing and inspection
* Service and maintenance

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| * 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Did troubleshoot of aircraft hydraulic system
	2. Remove aircraft hydraulic components
	3. Serviced/ repaired aircraft hydraulic components/systems
	4. Fitted/replaced aircraft hydraulic components/systems
	5. Installed aircraft hydraulic system
	6. Tested aircraft hydraulic system
 |
| * 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| * 1. Methods of Assessment.
 | Competency may be assessed through:3.1 Practical3.2 Observation3.3 Questionnaire3.4 Case studies3.5 Written examinations3.6 Oral presentation |
| * 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| * 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## CARRY OUT AIRCRAFT PNEUMATIC SYSTEM MAINTENANCE

**UNIT CODE:** ENG/OS/AFE/CR/05/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to carry aircraft pneumatic system maintenance. It involves assessing aircraft pneumatic system, removing aircraft pneumatic components, servicing/ repairing/replacing aircraft pneumatic components, installing aircraft pneumatic system and testing aircraft pneumatic system.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Assess aircraft pneumatic system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Pneumatic system manual is interpreted according to system requirements
	3. Tools and equipment are identified according to system requirements
	4. Defects are located using troubleshooting techniques and/or inspection procedures appropriate to the defect indications in accordance with organization procedures and manufacturer’s manual.
	5. Defects are reported and documented in accordance with organization procedures.
 |
| 1. Remove aircraft pneumatic components/systems
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Maintenance manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. ***Pneumatic components*** are detached from system according to work requirements
	5. Detached hydraulic components are cleaned and stored according to manufacturer’s specifications
 |
| 1. Service/ repair/replace aircraft pneumatic components
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Maintenance manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Components are serviced according to the service manual and specifications
	5. Replacement parts are verified as authentic and serviceable in accordance with organization procedures.
	6. Defects are rectified in accordance with organization procedures.
	7. System is tested to verify serviceability in accordance with organization procedures.
	8. ***Pneumatic system*** service/repairs/replacements are documented according to SOPs
	9. Pneumatic components are bench tested for functionality in accordance with component maintenance manuals.
 |
| 1. Install aircraft pneumatic system/components
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Installation manuals are interpreted according to SOPs
	3. Pneumatic system components are identified according installation manual
	4. System components layout is done according to installation manual
	5. Tools and equipment are selected and checked to be in usable condition according to user manual
	6. Pneumatic system is installed according to installation manual
	7. Installation work is documented in accordance with organizational procedures.
 |
| 1. Test aircraft pneumatic system
 | * 1. ***Peripheral devices*** are verified if they are properly connected according system manual
	2. Peripheral devices functionality is verified according to system manual
	3. Air validity is verified according prescribed system requirements
	4. Air leakages are checked according to prescribed air leakage checking methods
	5. Testing equipment are selected and operated correctly according to manufacturer’s specifications
	6. Air flow is tested according to design specifications
	7. Aircraft is restored to normalcy in accordance with aircraft maintenance manual.
	8. Aircraft pneumatic system installation is documented in accordance with organization procedures.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Pneumatic components may include but not limited to:
 | * Air pumps
* Engine bleed air valves
* Filters
* Valves
* Heat exchangers
* Pressurisation outflow valves
* Pressurisation safety valves
* Pressurisation controllers
* Actuators
* Ducting and plumbing
* Reservoirs
* Sensors
* Indicators, lights and switches
 |
| 1. Pneumatic system may include but not limited to:
 | * Pneumatic air source and distribution
* Air cycle air conditioning
* Pressurisation
* Anti-ice
* Interfaces with other aircraft systems and with electrical and instrument systems
 |
| 1. Peripheral devices may include but not limited to:
 | * Pipes/tubes/hoses/connectors
* Gauges
* Valves
* Instruments
* Sensors
* Pumps
* Reservoirs
* Compressors
* Regulators
* Filters
* Seals
* Power units
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Using hand skills, tools and test equipment in the testing, adjustment and troubleshooting of light aircraft pneumatic systems and components, including pneumatic system component removal and installation
* Recognizing pneumatic system and component defects/external damage, correct installation and security for the types of systems listed in the range of conditions
* Performing system functional tests and checks to isolate system faults and assess post-maintenance serviceability
* Effectively using maintenance documentation and relevant fault diagnosis guides in the troubleshooting process and for component removal and installation
* Applying standard procedures
* Observing of all relevant WHS procedures including the use of PPE and MSDS.

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* WHS precautions relevant to aircraft pneumatic system maintenance and how to obtain PPE and MSDS
* Standard trade practices relating to tool and test equipment usage and installation/securing of system components
* Types of aircraft pneumatic system and components thereof:
* Vacuum
* Positive pressure
* High pressure
* Pneumatic system layout, operation and characteristics and system component operation and construction, including electrical and instrument system interfaces
* How to configure the aircraft for inspection, testing and troubleshooting of pneumatic systems and components
* Pneumatic system maintenance requirements and troubleshooting
* Component attachment methods
* Connection hardware and couplings
* Electrical circuit isolation and plug removal and installation
* Relevant maintenance manuals
* Relevant regulatory requirements and standard procedures.

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Assessed aircraft pneumatic system
	2. Removed aircraft pneumatic component
	3. Serviced/ repaired/replaced aircraft pneumatic components
	4. Installed aircraft pneumatic system
	5. Tested aircraft pneumatic system
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. On the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | This unit may be assessed on an integrated basis with others within this occupational sector. |

## SERVICE AIRCRAFT FUEL SYSTEM

**UNIT CODE:** ENG/OS/AFE/CR/06/6/A

**UNIT DESCRIPTION**

This unit covers the competencies required to service aircraft fuel system. It involves determining fuel system/components maintenance requirements, troubleshooting aircraft fuel system/components, dismantling and inspecting fuel system/components, repairing and or modifying fuel system /components or parts and assembling, testing and adjusting fuel system components.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| * + 1. Determine fuel system/components maintenance requirements
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Component defect reports (removal tags) or customer order are correctly interpreted and matched by part and serial numbers in accordance with SOPs
	3. ***Fuel system components*** are inspected and/or operated through prescribed test procedures to establish serviceability or confirm defects, as required in accordance with manufacturer manuals
	4. Modification status is clearly established to assist in determining the overhaul/ repair requirements for the components in accordance with manufacturer manuals
	5. Extent of overhaul or repair is identified and documented in accordance with standard workplace procedures
 |
| * + 1. Troubleshoot aircraft fuel system/components
 | * 1. Available information from maintenance records and test results is used, where necessary, to assist in fault determination in accordance with troubleshooting findings
	2. Logical processes are used to ensure efficient and accurate troubleshooting in accordance with manufacturer manuals
	3. Specialist advice is obtained, where required, to assist with, or confirm, the fault and rectification requirement
	4. Fuel system component faults are located and the causes of the faults are clearly identified in accordance with manufacturer manuals
	5. Fault rectification requirements are determined to assist in planning the repair in accordance with manufacturer manual
 |
| * + 1. Dismantle and inspect fuel system/component parts
 | * 1. Fuel system component parts are dismantled in accordance with maintenance manuals while observing all relevant work health and safety (WHS) requirements, including the use of material safety data sheets (MSDS) and items of personal protective equipment (PPE)
	2. Component parts are assessed for serviceability in accordance with the relevant maintenance documentation
	3. Parts requiring specialist repair are tagged and repair instructions are specified in accordance with standard organization procedures
	4. Parts requiring non-destructive testing (NDT) are prepared for testing in accordance with the relevant maintenance documentation
	5. Parts lists are compiled and processed in accordance with standard organization procedures
	6. All work done is documented in accordance with organizational procedures.
 |
| 4.Repair and/or modify fuel system/components or parts | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. ***Component parts*** are repaired or replaced in accordance with the relevant maintenance documentation
	5. Modification of components or parts is undertaken, where required, by relevant manufacturer's bulletins or procedures
	6. All work done is documented in accordance with organizational procedures.
 |
| 1. Assemble, test and adjust fuel system components
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Fuel system component parts are assembled within specified tolerances and in accordance with the appropriate maintenance documents while observing all relevant WHS requirements, including the use of MSDS and items of PPE
	5. Components are adjusted, tested or calibrated to operate within prescribed specifications
	6. Finished components are tagged, sealed and packaged in accordance with standard organization procedures
	7. Required maintenance documentation and modification records are completed and processed in accordance with standard organization procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. **Fuel system components** may include but not limited to:
 | * Valves
* Pumps
* Control units
* Filters, rigid and flexible pipelines, hoses, fittings and flexible fuel tanks
 |
| 1. **component parts** may include but not limited to:
 | * Finishing or re-finishing of metal surfaces through processes, such as polishing and lapping
* Removal of corrosion within maintenance manual limits
* Replacement of seals and backing rings
* Replacement of bearings
* Application of surface treatments, such as alodining
* Restoration of paint finishes
* Repair of flexible fuel tank leaks
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Communication skills
* Problem solving
* Creativity and innovation
* Data collection and analysis
* Use of tools and equipment
* Technical presentation
* Technical drawing
* Installation and fabrication
* Interpretation of installation manuals
* Service and maintenance how to obtain relevant MSDS
* The use of applicable items of PPE
* WHS procedures
* Fault diagnosis techniques
* System and component operation
* Repair and overhaul procedures and processes
* The use of fuel system test rigs.

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Technical report writing
* Data analysis and interpretation
* Interpretation of technical drawings
* Documentation
* Types of tools and equipment
* Properties of fuels
* Fuel contaminants
* Safety and hazards
* Types of fuels
* Testing and inspection
* Service and maintenance processes
* How to obtain relevant MSDS
* The use of applicable items of PPE
* WHS procedures
* Fault diagnosis techniques
* System and component operation
* Repair and overhaul procedures and processes
* The use of fuel system test rigs.
* Regulation governing aircraft fuel system safety
* Fuel tank safety

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Did troubleshooting of aircraft fuel system
	2. Serviced fuel system pump
	3. Serviced/repaired fuel tanks
	4. Serviced/ repaired fuel system components
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**MAINTAIN AIRCRAFT DE-ICING AND RAIN PROTECTION SYSTEM**

**UNIT CODE:** ENG/OS/AFE/CR/07/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to maintain aircraft de-icing and rain protection system. It involves competencies required to troubleshoot aircraft de-icing and rain protection system, service/ repair ice detector system, maintain wing and horizontal and vertical stabilizer anti-icing system, service/repair propeller de-ice system, perform aircraft ground de-icing and maintain aircraft rain control system

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| 1. Determine aircraft de-icing/inti-icing and rain protection system maintenance requirements
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Component defect reports (removal tags) or customer order are correctly interpreted and matched by part and serial numbers in accordance with SOPs
	3. ***De-icing and rain protection components*** are inspected and/or operated through prescribed test procedures to establish serviceability or confirm defects, as required in accordance with manufacturer manuals
	4. Modification status is clearly established to assist in determining the overhaul/ repair requirements for the components in accordance with manufacturer manuals
	5. Extent of overhaul or repair is identified and documented in accordance with standard workplace procedures
 |
| 1. Troubleshoot aircraft de-icing/anti-icing and rain protection system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Aircraft de-icing and rain protection system manual is interpreted according to work requirements
	3. Tools and equipment are identified according to system requirements
	4. Defects are located using troubleshooting techniques and/or inspection procedures appropriate to the defect indications in accordance with work specifications.
	5. Defects are reported and documented in accordance with organization procedures
 |
| 1. Service/ repair ice detector/rain protection system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Defects are identified according to the service manual and specifications
	5. Ice detector sensors are serviced/repaired according to service manual
	6. Replacement parts are verified as authentic and serviceable in accordance with organization procedures.
	7. Defects are rectified in accordance with organization procedures
 |
| 1. Maintain aircraft anti-icing/anti-icing system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. System fault diagnosis is done according to manufacturer’s specifications
	5. Defects are identified according to the service manual and specifications
	6. Faulty devices are detached from the system according to necessary safety procedures
	7. Faulty devices are repaired/replaced according to the service manual and specifications
	8. Aircraft anti-icing system is tested in accordance with the manufacturer manual.
	9. System faults and/or repairs are documented according to SOPs
	10. ***Anti-icing system*** is maintained according to maintenance schedule
 |
| 1. Perform aircraft ground de-icing/anti-icing
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Ground de-icing manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. ***De-icing method*** is selected according to work requirements
	5. ***De-icing fluids*** are selected and confirmed to be in good usable condition according to work requirements
	6. Aircraft ground de-icingis carried out according to work requirements
	7. De-icing site is kept clean of used de-icing fluids according to safety requirements
	8. De-icing waste is treated before allowed to enter water ways according to environmental requirements
 |
| 1. Maintain aircraft rain control system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. ***Aircraft rain control system*** fault diagnosis is done according to manufacturer’s specifications
	5. Defects are identified according to the service manual and specifications
	6. Faulty devices are detached from the system according to necessary safety procedures
	7. Faulty devices are repaired/replaced according to the service manual and specifications
	8. Rain protection system is tested in accordance with the manufacturer manual.
	9. Aircraft is restored to normalcy.
	10. System faults and/or repairs are documented according to SOPs.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Personal protective equipment may include but not limited to:
 | * Goggles
* Ear muff
* Safety mask
* Helmets/head gear
* Safety boots
* Gloves
* Overall/dust coat
 |
| 1. Anti-icing system may include but not limited to:
 | * Thermal Pneumatic Anti-icing
* Thermal Electric Anti-Icing
* Thermal Electric Anti-Icing
 |
| 1. Propeller de-icing system may include but not limited to:
 | * Electro thermal Propeller De-ice System
* Chemical Propeller De-ice
 |
| 1. De-icing fluidsmay include but not limited to:
 | * Type I-Low viscosity fluids
* Type II-Pseudo plastic fluids
* Type III-Compromise between type I and type II fluids
* Type IV-Longer holdover fluids
 |
| 1. De-icing methodmay include but not limited to:
 | * Mechanical and Non-Chemical De-icing Method
* Chemical method
* Infrared heating de-icing method
 |
| 1. Aircraft rain control systemmay include but not limited to:
 | * Windshield Wiper Systems
* Chemical Rain Repellant
* Pneumatic rain removal system
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Testing of hydraulic and pneumatic systems
* Operating of de-icing systems
* Operation of rain control systems
* De-icing fluids
* De-icing methods
* Hazards and safety measures in de-icing and rain control
* Equipment inspection and testing
* Communication skills
* Problem solving
* Data collection and analysis
* Service and repair of system components
* Fault diagnosis
* Attention to details

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Technical report writing
* Data analysis and interpretation
* Interpretation of technical drawings
* Documentation
* Types of tools and equipment
* Types of defects in aircraft de-icing and rain control systems
* Safety and hazards
* MSDS
* Testing and inspection
* Service and maintenance processes
* Documentation
* Scheduling/planning for maintenance
* Scientific methods
* Environmental regulations
* Fluid dynamics
* Thermodynamics
* Standard units used in fluids

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Did troubleshoot aircraft de-icing and rain protection system
	2. Serviced/ repaired ice detector system
	3. Maintained wing and horizontal and vertical stabilizer anti-icing system
	4. Serviced/repaired propeller de-ice/anti-icing system
	5. Performed aircraft ground de-icing/anti-icing
	6. Maintained aircraft rain control system
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. On the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## MAINTAIN AIRCRAFT LANDING GEAR SYSTEM

**UNIT CODE:** ENG/OS/AFE/CR/08/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to maintain aircraft landing gear system. It involves determining aircraft landing gear system maintenance requirements, troubleshooting and overhauling aircraft landing gear and emergency extension, servicing/repairing aircraft steering system and wheels, maintaining aircraft brakes and servicing aircraft tires.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| 1. Determine aircraft landing gear system maintenance requirements
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Component defect reports (removal tags) or customer order are correctly interpreted and matched by part and serial numbers in accordance with SOPs
	3. ***Aircraft landing gear system components*** are inspected and/or operated through prescribed test procedures to establish serviceability or confirm defects, as required in accordance with manufacturer manuals
	4. Modification status is clearly established to assist in determining the overhaul/ repair requirements for the components in accordance with manufacturer manuals
	5. Extent of overhaul or repair is identified and documented in accordance with standard workplace procedures
 |
| 1. Troubleshoot aircraft landing gear system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Aircraft landing gear system manual is interpreted according to work requirements
	3. Tools and equipment are identified according to system requirements
	4. Defects are located using troubleshooting techniques and/or inspection procedures appropriate to the defect indications in accordance with work specifications.
	5. Defects are reported and documented in accordance with organization procedures
 |
| 1. Overhaul aircraft landing gear and emergency extension
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Site is cleaned and organised according to SOPS
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Aircraft landing gear and emergency extension is disassembled and parts stored safely according to required procedures
	5. Worn out parts are identified according to system manual
	6. Worn out parts are replaced according to manufacturer manual
	7. Aircraft landing gear and emergency extension components are inspected according to manufacturer’s recommendation
	8. Parts are cleaned and prepared according to work requirements
	9. Aircraft landing gear and emergency extension is re-assembled according to manufacturer manual
	10. System is tested and operating parameters recorded in accordance with manufacturer manual and SOPs.
 |
| 1. Service/repair aircraft steering system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is interpreted according to work requirements
	3. ***Tools and equipment*** are selected and checked to be in usable condition according to user manual
	4. Aircraft nose wheel steering system is inspected in accordance with manufacturer manual.
	5. Defects are identified according to the service manual and specifications
	6. Nose wheel steering systemis serviced/repaired according to service manual
	7. Replacement parts are verified as authentic and serviceable in accordance with organization procedures.
	8. Defects are rectified in accordance with organization procedures
	9. Aircraft steering system is tested in accordance with manufacturer manual.
	10. Service/repairs are documented according to SOPS
 |
| 1. Service/repair aircraft wheels
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is interpreted according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Aircraft wheels are inspected in accordance with manufacturer manual.
	5. Defects are identified according to the service manual and specifications
	6. Aircraft wheels are serviced/repaired according to service manual
	7. Replacement parts are verified as authentic and serviceable in accordance with organization procedures.
	8. Defects are rectified in accordance with organization procedures
	9. Aircraft wheels are tested in accordance with manufacturer manual.
	10. Service/repairs are documented according to SOPS
 |
| 1. Maintain aircraft brakes
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is analysed according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Aircraft braking system is inspected in accordance with the manufacturer manual.
	5. Aircraft brake system fault diagnosis is done according to manufacturer’s manual
	6. Defects are identified according to the service manual and specifications
	7. ***Faulty components*** are detached from the system according to necessary safety procedures
	8. Faulty components are repaired/replaced according to the service manual and specifications
	9. System faults and/or repairs are documented according to SOPs
	10. Aircraft braking is system is bench tested in accordance with manufacturer manual.
	11. All work is documented in accordance with organization work procedures.
 |
| 1. Service aircraft tires
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is interpreted according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Aircraft tires are inspected in accordance with manufacturer manual.
	5. Defects are identified according to the service manual and specifications
	6. Aircraft tires are serviced/repaired according to service manual
	7. Replacements are verified as authentic and serviceable in accordance with manufacturer manual and organization procedures.
	8. Defects are rectified in accordance with manufacturer manual
	9. Tires are tested in accordance with manufacturer manual.
	10. Service/repairs are documented according to organization procedures and SOPS
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Tools and equipmentmay include but not limited to:
 | * Standard maintenance tool box
* Pressure gauge
* Brake rivet tool
* Hydraulic Fluid cart
 |
| 1. Faulty componentsmay include but not limited to:
 | * Valves
* Gaskets
* O-rings
* Washers
* Linings
* Discs
* Pistons
* Housing
* Springs
* Screws
* Tire defects
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in***:***

* Testing of aircraft systems
* Operating of aircraft systems
* Aircraft system equipment inspection and testing
* Communication skills
* Problem solving
* Data collection and analysis
* Service and repair of system components
* Fault diagnosis
* Attention to details
* Use hand skills and tools to remove and install landing gear system components
* Jack the aircraft as required for landing gear component removal and installation
* Correctly install and secure aircraft hardware
* Use hand skills and tools to remove and install landing gear components and use safe handling techniques with heavy components
* Use maintenance manuals to prepare the aircraft for component removal and installation and for correct interpretation of removal and installation instructions
* Use attachment methods, connection hardware and couplings to each type of system
* Apply standard industry and organisational procedures
* Observe all required occupational health and safety (OHS) procedures, including the use of safety data sheets (SDS) and required items of personal protective equipment (PPE)
* Comply with cleanliness requirements and safety precautions applicable to system being maintained.

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Documentation
* Scheduling/planning for maintenance
* Service and repair of aircraft units
* Aircraft system performance
* Technical report writing
* Data analysis and interpretation
* Interpretation of technical drawings
* Types of tools and equipment
* Types of defects in aircraft wheel and tire systems
* Safety and hazards
* Industry, regulatory, manufacturer and organisational requirements, procedures, practices and methods required for the tasks described in the performance evidence, including:
* WHS requirements relating to removing and installing hydro-mechanical and landing gear system components, including:
* Use of SDS and items of PPE
* Handling aircraft fuels and associated precautions
* Procedures for:
* Locating and correctly removing and installing components of landing gear systems
* Locating and correctly removing and installing landing system components
* Isolating electrical circuits and removing and installing plugs
* Jacking the aircraft for landing gear component removal and installation
* Locating and correctly removing and installing landing gear components, including handling heavy components
* Obtaining SDS
* Selecting and using items of PPE
* Tagging, sealing, and packaging removed components
* Completing and processing maintenance documentation
* Maintenance manual requirements relating to:
* Rendering systems safe
* Removing and installing components
* Standard trade practices relating to tool use and installation/securing of aircraft hardware
* Key characteristics of hydraulic fluids (mineral and synthetic) and associated handling precautions
* Hydraulic seal types and applications
* Fuel seal types and applications.

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Troubleshooted aircraft power transmission system
	2. Did overhaul of aircraft landing gear and emergency extension
	3. Serviced/repaired steering system
	4. Serviced/repaired aircraft wheels
	5. Maintained aircraft brakes
	6. Serviced aircraft tires and tubes
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. On the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## MAINTAIN AIRCRAFT FIRE PROTECTION SYSTEM

**UNIT CODE:** **ENG/OS/AFE/CR/09/6/A**

**Unit description**

This unit describes the competencies required by a technician to maintain aircraft fire protection system. It involves installing fire/heat/smoke detection system, firefighting system, servicing/ repairing fire fighting equipment and testing aircraft fire detection and protection system.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Install fire/heat/smoke detection system
 | 1. Work safety is observed and adhered to according to health and safety legislation and regulations
2. Installation ***tools and equipment*** are selected and checked to be in usable condition according to manual
3. Installation manual is analysed according to work requirements
4. Aircraft fire/heat/smoke detection system is installed and positioned according to installation manual
5. ***Fire detection components*** are checked to ensure are properly secured according to installation manual
6. System is tested according to installation manual
 |
| 1. Install fire extinguishing system
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Installation tools and equipment are selected and checked to be in usable condition according to manual
	3. Installation manual is analysed according to work requirements
	4. Firefighting system is inspected for validity as per the manufacturer manual.
	5. Firefighting System is installed and positioned according to installation manual
	6. Components are checked to ensure are properly secured according to installation manual
	7. System is tested according operation parameters
	8. ***Installation details*** are documented according to organizational procedures.
 |
| 1. Service/ repair fire-extinguishing equipment
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Service manual is interpreted according to work requirements
	3. Tools and equipment are selected and checked to be in usable condition according to user manual
	4. Fire extinguishing equipment is inspected and diagnosed for defect identification in accordance with manufacturer manual.
	5. Defects are identified according to the service manual and specifications
	6. ***Fire extinguishing equipment*** are serviced/repaired according to service manual
	7. Replacement parts are verified as authentic and serviceable in accordance with organization procedures.
	8. Defects are rectified in accordance with organization procedures
	9. Fire extinguishing equipment is tested for function in accordance with the manufacturer manual.
	10. Service/repairs are documented according to SOPS
 |
| 1. Test aircraft fire detection and protection system
 | * 1. Aircraft fire detection and protection system are correctly prepared in accordance with applicable maintenance manual and connected to appropriate test equipment
	2. Built-in system test functions and status displays are activated, where applicable, outputs recorded and interpreted
	3. Assistance is provided with gas turbine engine and/or system operation during prescribed test procedures to establish serviceability and correct function in accordance with applicable maintenance manual
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Tools and equipmentmay include but not limited to:
 | * Portable gas detection instrument
* Standard tool box
 |
| 1. Fire detection componentsmay include but not limited to:
 | * Fire detection loops
 |
| 1. Installation detailsmay include but not limited to:
 | * Expiry date
* Installation date
* Inspection date
* Inspecting personnel
* Next inspection date
 |
| 1. Fire extinguishing equipmentmay include but not limited to:
 | * Portable fire extinguisher
* Fire bottle
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Testing of aircraft systems
* Operating of aircraft systems
* Aircraft system equipment inspection and testing
* Communication skills
* Problem solving
* Data collection and analysis
* Service and repair of system components
* Fault diagnosis
* Attention to details
* Applying work, health and safety (WHS)/occupational health and safety (OHS) requirements including:
* Emergency procedures
* Hazard identification
* Risk control measures
* Safe working practices
* Assessing fixed fire system and equipment
* Communicating with personnel
* Completing work as per scheduling requirements
* Conducting in-service testing of fire protection system
* Dismantling and reassembling components
* Interpreting manufacturers' specifications and manuals
* Maintaining fixed fire protection systems
* Performing removal and replacement techniques and procedures
* Planning for fixed fire protection maintenance and testing work
* Selecting and using overhaul and maintenance techniques and procedures
* Using tools and measuring equipment
* Utilizing technical drawings and data
* Working with diagnostic, testing techniques, levelling and alignment techniques

**Required Knowledge**

The individual needs to demonstrate knowledge of***:***

* Documentation
* Fire extinguisher serviceability
* Scheduling/planning for maintenance
* Service and repair of aircraft units
* Aircraft system performance
* Technical report writing
* Data analysis and interpretation
* Interpretation of technical drawings
* Documentation
* Types of tools and equipment
* Types of defects in aircraft systems
* Safety and hazards
* Assessment techniques
* Data recording techniques
* Diagnostic and testing techniques
* Generation plant, equipment and its location
* Legislation, industry standards, codes of practice and regulations
* Manufacturers' specifications and manuals
* Measuring equipment
* Plant and systems
* Technical drawings and data
* Tools
* Types of fixed fire protection systems and characteristics
* Typical arrangements of power production plant
* WHS/OHS legislated requirements including:
* Emergency procedures
* Hazard identification
* Risk control measures
* Safe working practices
* Workplace documentation
* Workplace policies and procedure

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Observed safety in site
	2. Installed fire/heat/smoke detection system
	3. Installed firefighting system
	4. Serviced/ repaired firefighting equipment
	5. Serviced aircraft assisted escape system
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

## MAINTAIN AIRCRAFT OXYGEN SYSTEMS

**UNIT CODE:** ENG/OS/AFE/CR/10/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to maintain aircraft oxygen system. It involves determining aircraft oxygen system serviceability, troubleshooting oxygen system components, dismantling and inspecting oxygen system components, repairing and/or modifying oxygen system components, assembling, testing and adjusting oxygen system components

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Determine aircraft oxygen system serviceability
 | 1. Work safety is observed and adhered to according to health and safety legislation and regulations
2. Component defect reports (removal tags) or customer order are correctly interpreted and matched by part and serial numbers
3. System components are inspected and/or operated through prescribed test procedures to establish serviceability or confirm defects, as required
4. Modification status is clearly established to assist in determining the overhaul requirements for the components
5. Extent of overhaul or repair is correctly identified and documented
 |
| 1. Troubleshoot oxygen system components
 | * 1. Available information from maintenance records and test results is used, where necessary, to assist in fault determination
	2. Logical processes are used to ensure efficient and accurate troubleshooting
	3. Specialist advice is obtained, where required, to assist with, or confirm, the fault and rectification requirement
	4. System component faults are located and the causes of the faults are clearly identified
	5. Fault rectification requirements are determined to assist in planning the repair
 |
| 1. Dismantle and inspect oxygen system components
 | * 1. System component parts are dismantled in accordance with maintenance manuals while observing all relevant work health and safety (WHS) requirements
	2. Component parts are assessed for serviceability in accordance with the relevant maintenance documentation
	3. Parts requiring specialist repair are tagged and repair instructions are accurately specified
	4. Parts lists are compiled and processed in accordance with standard enterprise procedures
 |
| 1. Repair and/or modify oxygen system components
 | * 1. ***Oxygen system component*** parts are repaired or replaced in accordance with the relevant maintenance documentation
	2. Modification of components or parts is undertaken, where required, by relevant manufacturer's bulletins or procedures
 |
| 1. Assemble, test and adjust oxygen system components
 | * 1. Assembly of component parts is carried out within specified tolerances and in accordance with the appropriate maintenance documents
	2. System components are adjusted or calibrated to operate within prescribed specifications
	3. Finished components are tagged, sealed and packaged in accordance with specified procedures
	4. Required maintenance documentation and modification records are completed and processed in accordance with standard organization procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Oxygen system components may include but not limited to:
 | * Cylinders
* Valves
* Masks
* Gauges
* Chemical generators/PSU
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**REQUIRED SKILLS**

The individual needs to demonstrate skills in:

* Applying relevant OHS practices
* Using approved repair/overhaul procedures and processes relating to oxygen components
* Recognising the serviceability state and repair or overhaul requirements for oxygen pressure cylinders, valves, gauges, chemical generators, regulators, masks, pipes, hoses and fittings, and liquid dry breathing oxygen (LDBO) converters
* Applying logic processes, and using test equipment and appropriate wiring diagrams and manuals to isolate component faults
* Performing component testing to isolate/confirm component fault and assess post-repair/overhaul serviceability
* Correctly disassembling, inspecting component parts, repairing/replacing/modifying component parts and assembling oxygen components
* Applying product hygiene procedures.

**Required Knowledge**

The individual needs to demonstrate knowledge of***:***

* Component and system operation
* The basic function and operation of oxygen components to enable testing for fault isolation/confirmation, to determine repair or overhaul requirements, and serviceability status post-repair or overhaul
* Basic principles/functions relating to oxygen components and associated with:
* Pressure sensitive devices (bellows and controllers)
* Vacuum system generation
* Atmosphere and its properties.
* MSDS

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Observed safety
	2. Installed aircraft oxygen control system
	3. Serviced and repaired aircraft oxygen system
	4. Tested aircraft oxygen systems
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## MAINTAIN AIRCRAFT AIR CONDITIONING AND PRESSURISATION

**UNIT CODE:** ENG/OS/AFE/CR/11/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to maintain aircraft air conditioning and pressurisation. It involves competencies required to determine aircraft environmental control system requirements, troubleshoot environmental control system components, dismantle and inspect environmental control system components, repair and/or modify environmental control system components, assemble, test and adjust environmental control system components

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Determine aircraft environmental control system serviceability
 | 1. Work safety is observed and adhered to according to health and safety legislation and regulations
2. Component defect reports (removal tags) or customer order are correctly interpreted and matched by part and serial numbers
3. System components are inspected and/or operated through prescribed test procedures to establish serviceability or confirm defects, as required
4. Modification status is clearly established to assist in determining the overhaul requirements for the components
5. Extent of overhaul or repair is correctly identified and documented
 |
| 1. Troubleshoot environmental control system components
 | * 1. Available information from maintenance records and test results is used, where necessary, to assist in fault determination
	2. Logical processes are used to ensure efficient and accurate troubleshooting
	3. Specialist advice is obtained, where required, to assist with, or confirm, the fault and rectification requirement
	4. System component faults are located and the causes of the faults are clearly identified
	5. Fault rectification requirements are determined to assist in planning the repair
 |
| 1. Dismantle and inspect environmental control system components
 | * 1. System component parts are dismantled in accordance with maintenance manuals while observing all relevant work health and safety (WHS) requirements
	2. Component parts are assessed for serviceability in accordance with the relevant maintenance documentation
	3. Parts requiring specialist repair are tagged and repair instructions are accurately specified
	4. Parts lists are compiled and processed in accordance with standard enterprise procedures
 |
| 1. Repair and/or modify environmental control system components
 | * 1. ***Environmental control system component*** parts are repaired or replaced in accordance with the relevant maintenance documentation
	2. Modification of components or parts is undertaken, where required, by relevant manufacturer's bulletins or procedures
 |
| 1. Assemble, test and adjust environmental control system components
 | * 1. Assembly of component parts is carried out within specified tolerances and in accordance with the appropriate maintenance documents
	2. System components are adjusted or calibrated to operate within prescribed specifications
	3. Finished components are tagged, sealed and packaged in accordance with specified procedures
	4. Required maintenance documentation and modification records are completed and processed in accordance with standard organization procedures
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Environmental control system components may include but not limited to:
 | * Compressor
* Condensing unit
* Evaporator
* Pipes
* Sensors
* Pressurization Gauges
* Cabin Air Pressure Safety Valve Operation
* Cabin Pressure Controller
* Combustion air heater system
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Applying relevant WHS practices
* Using approved repair/overhaul procedures and processes relating to environmental control system components
* Recognising the serviceability state and repair or overhaul requirements for environmental control system components.
* Applying logic processes, and using test equipment and appropriate wiring diagrams and manuals to isolate component faults
* Performing component testing to isolate/confirm component fault and assess post-repair/overhaul serviceability
* Correctly disassembling, inspecting component parts, repairing/replacing/modifying component parts and assembling environmental control system components
* Applying product hygiene procedures.

**Required Knowledge**

The individual needs to demonstrate knowledge of***:***

* Component and system operation
* The basic function and operation of environmental control system components to enable testing for fault isolation/confirmation, to determine repair or overhaul requirements, and serviceability status post-repair or overhaul
* Basic principles/functions relating to environmental control system components and associated with:
* Pressure sensitive devices (bellows and controllers)
* Vacuum system generation
* Atmosphere and its properties.
* Effect of altitude on pressure

 **EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Observed safety
	2. Installed aircraft environmental control system
	3. Serviced and repaired aircraft environmental system
	4. Tested aircraft environmental systems
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |

## PERFORM AIRCRAFT EXTERIOR WORKS

**UNIT CODE:** ENG/OS/AFE/CR/12/6/A

**UNIT DESCRIPTION**

This unit describes the competencies required by a technician to perform aircraft body works. It involves performing aircraft towing, aircraft body inspection, cleaning aircraft body, painting aircraft surfaces, carrying out aircraft transfer, decals and livery and striping and removing aircraft finishes

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Perform aircraft towing
 | 1. Work safety is observed and adhered to according to health and safety legislation and regulations
2. Operational inspection of tow tractor and tow bar is conducted before use as per work requirements.
3. Cleanliness of the towing tractor is maintained as per user requirements.
4. Radio communication, towing request instruction are monitored as per organization requirements.
5. Towing task is performed as per organization directives and procedures.
 |
| 1. Perform aircraft exterior inspection
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Inspection tools and equipment are selected and checked to be in usable condition according to manual
	3. ***Publications*** are analysed according to work requirements
	4. Aircraft logbooks are reviewed according to work requirements
	5. Checklists are reviewed to ensure no items are overlooked according to work requirements
	6. Aircraft body is visual inspected for defects according to work requirements
	7. ***Special detail inspection*** is carried out according to work requirement
	8. Inspection results are documented according to SOPs
 |
| 1. Clean aircraft body
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Cleaning water is provided according to cleaning procedures
	3. ***Cleaning tools and detergents*** are provided according to cleaning procedures
	4. ***Open sections*** are covered before cleaning according to safety procedures
	5. Banner is attached to covered areas according to safety procedures
	6. Aircraft body is cleaned according to work requirements
	7. Banner is removed from covered parts according to safety procedures
 |
| 1. Paint aircraft surfaces
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Working environmental conditions are identified and adhered to in accordance with the maintenance manual and manufacturer specifications.
	3. Painting task is identified from maintenance documentation and organization procedures and ***type of substrate*** is identified
	4. Organization procedures and maintenance publications are used to identify required ***materials, tools and equipment*** and necessary items are assembled
	5. Aircraft or component identification is matched with relevant maintenance documentation
	6. Surfaces are prepared for application of paint finishes in accordance with maintenance manual and organization procedures and/or process specification
	7. Masking and barrier materials are applied as required by task
	8. Temperature and humidity requirements are complied with
	9. Reject paintwork is identified and rectified in accordance with organization procedures and/or process specification
	10. The specified top coat material is prepared in accordance with manufacturer's instructions
	11. Documentation is completed in accordance with standard organization procedures
	12. Waste material is removed and disposed of or stored in accordance with legislative, regulatory and organization procedures
	13. Equipment is cleaned in accordance with organization procedures or manufacturer's instructions
	14. Equipment is checked for serviceability and unserviceable items are dealt with in accordance with organization procedures
	15. Tools are cleaned and maintained in accordance with organization procedures
	16. Work area is cleaned and inspected for serviceable condition
 |
| 1. Carry out aircraft transfer, decals and livery
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Aircraft transfers are performed according to work requirements
	3. Aircraft decals are carried out according to work requirements and manual instructions.
	4. Aircraft liveries are carried out according to work requirements and manual instructions
	5. Aircraft is restored to normalcy.
 |
| 1. Strip and remove aircraft finishes
 | * 1. Work safety is observed and adhered to according to health and safety legislation and regulations
	2. Publications are analysed according to work requirements
	3. ***Stripping/aircraft finishes removing method*** is selected according to work requirements
	4. Strip and aircraft finishes are removed according to the prescribed guidelines
	5. Surface is cleaned according to safety guidelines
	6. Aircraft is restored to normalcy.
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range*****May include but is not limited to:*** |
| --- | --- |
| 1. Publications may include but not limited to:
 | Include information provided by: * Aircraft manufacturers
* Appliance manufacturers
* Parts venders
* Structural Repair Manual
 |
| 1. Special detail inspection may include but not limited to:
 | * Cameras
* 3D scanners
* Borescope inspection
 |
| 1. Cleaning tools and detergents may include but not limited to:
 | * Towels
* Aluminum-safe degreaser
* Wash soap
* Plexiglas cleaner
* Aircraft-specific paint sealant or wax
* Emery cloth
 |
| 1. Open sections may include but not limited to:
 | * Static ports
* Pitot tube
* Angle of attack sensor
 |
| 1. Type of substrate may include but not limited to:
 | * High strength steel
* Aluminum alloys
* Composite fibre
* Plastic
* Transparencies
* Magnesium alloy
* Fabric
* Wood
 |
| 1. Materials and tools may include but not limited to:
 | * Epoxy primers
* Lacquer primers
* Acrylic top coats
* Polyurethane top coats
* Chemicals
* Masking and barrier materials
* Low pressure gun or touch-up gun
* General purpose suction feed spray guns
* Airless spray units
* Electrostatic spray equipment
* Sanding/polishing equipment and materials
* PPE
 |
| 1. Stripping/aircraft finishes removing method may include but not limited to:
 | * Methylene chloride
* Chemical strippers
* Benzyl alcohol stripping
* Hydrogen peroxide strippers
* Abrasive strippers
* Laser paint removal
 |

**EQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in:

* Manufacturer specifications and directions
* Types of paint finishes and applicability to various substrates
* Procedures for preparing surfaces for paint application
* Types of masking and barrier materials
* Methods used for final finishing of surfaces
* Environmental legislation and regulations relating to the storage, use and disposal of hazardous materials
* Communication skills
* Problem solving
* Data collection and analysis
* Attention to details

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Relevant organization procedures, process specifications and maintenance publications
* Manufacturer specifications and directions
* Types of paint finish and applicability to various substrates
* Procedures for preparing surfaces for paint application
* Types of masking and barrier materials
* Methods used for final finishing of surfaces
* Environmental legislation and regulations relating to the storage, use and disposal of hazardous materials
* Documentation
* MSDS
* Scheduling/planning for maintenance
* Aircraft system performance
* Technical report writing
* Data analysis and interpretation
* Interpretation of technical drawings

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Observed safety in site
	2. Performed aircraft towing
	3. Performed aircraft body inspection Installed aircraft cabin pressure control system
	4. Cleaned aircraft body
	5. Painted aircraft surfaces
	6. Carried out aircraft transfer, decals and livery
	7. Strip and remove aircraft finishes
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## MANAGE AVIATION MAINTENANCE PROJECTS

**UNIT CODE:** ENG/OS/AFE/CR/13/6/A

**Unit description**

This unit describes the competencies required by a technician to manage aviation maintenance projects. It involves planning for aviation maintenance project, implementing avionic maintenance activities, providing aviation maintenance guidance, monitoring and certifying aviation maintenance quality, managing human resource activities, performing workplace avionic training tasks and generating aviation technical report and publications.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT** These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**These are assessable statements which specify the required level of performance for each of the elements.***(Bold and italicized terms are elaborated in the Range)*** |
| --- | --- |
| 1. Plan for aviation maintenance project
 | 1. Maintenance tasks are identified and analysed from available maintenance data or schedule according to organisational procedures
2. Team workload is organised in order of priority taking into consideration required maintenance tasks and specified timeframes
3. ***Required resources*** are identified and obtained according to available maintenance tasks
4. ***Tools and support equipment*** are checked for serviceability and currency of calibration, where applicable
 |
| 1. Implement avionic maintenance activities
 | * 1. Allocate maintenance tasks to team members after consideration of individual experience, qualifications and task authorisations
	2. Team members are briefed on their responsibility and function in the team according to their qualification and task assigned
	3. Team members are authorised to operate required items of ground support and test equipment
 |
| 1. Provide aviation maintenance guidance
 | * 1. Provide guidance to team members appropriate to complexity or criticality of maintenance task and experience level of individual
	2. Provide guidance in determining cause of complex faults or faults not covered in maintenance manual fault diagnosis guides
 |
| 1. Monitor and certify aviation maintenance quality
 | * 1. Check maintenance activities and guide personnel to ensure that maintenance is performed and certified according to required documentation, policies, and procedures
	2. Perform check inspections on completed work or work stages and certify the work according to regulatory requirements, policies and procedures
 |
| 1. Manage human resource activities
 | * 1. Identify and address ***human factors*** affecting job performance
	2. Minimise the possibility of maintenance errors
	3. Maintain sound teamwork by supporting the identification of contributing factors
	4. Support sound employment relations
 |
| 1. Perform workplace aviation training tasks
 | * 1. Deliver on-the-job training according to organization policy
	2. Complete Supervisor’s Verification section of the Workplace History Sheets of the Log of Industrial Experience and Achievement/appraisal
	3. Provide expert witness verification of competency for workplace assessors, when required
	4. Provide opportunities for individuals to develop competencies according to human resource manual.
 |
| 1. Generate aviation technical report and publications
 | * 1. The required medium, style and layout are determined
	2. Relevant data is obtained or accessed
	3. Potential problems are identified, and relevant experts are identified and consulted
	4. Problem resolution strategies are determined
	5. The publication or amendment is drafted using relevant guidelines and specified software package
	6. Copyright legislation is observed
	7. Completed graphics are inserted into the draft and annotations/labels added
	8. The draft is prepared for publishing and is submitted for editorial review
	9. Publication or amendment is published
	10. The publication management database is updated, and the completed publication is delivered or distributed
 |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Required resources may include but not limited to:
 | * Human resource
* Machines
* Tools and equipment
* Capital
 |
| 1. Tools and support equipment may include but not limited to:
 | * Avionic tool box
* Consumables
* Pitot static leak tester
* Time domain reflectometer
* Heat gun
 |
| 1. Human factors may include but not limited to:
 | * Behaviour
* Fatigue
* Knowledge
* Experience
* Performance
* Age
 |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes the skills and knowledge required for this unit of competency.

**Required Skills**

The individual needs to demonstrate skills in***:***

* Measurements
* Equipment inspection and testing
* Communication skills
* Problem solving
* Data collection and analysis
* Documentation
* Management
* Project development
* Attention to details

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Principles of supervision
* High level technical knowledge applicable to the job
* Fault diagnosis techniques
* Key features and uses of maintenance data and documentation applicable to maintenance activities described in the performance evidence
* Operating manuals
* Maintenance manuals
* Organizational policy manuals
* Quality manuals
* Safety manuals
* Procedures manuals
* Safety data sheets (SDS)
* Work instructions
* Standing instructions
* Regulations, policies and procedures relating to supervision and certification of maintenance, including:
* Human factors with the potential to affect job performance in aviation maintenance activities, and associated guidelines
* Key principles of employment relations and conditions relating to the work described in the performance evidence, including:
* Relevant sections of industrial awards
* Content of enterprise agreements
* Conditions of employment and service that apply to the particular workplace
* Equity, diversity and fraud requirements set out in organizational code of conduct specific to the work described in the performance evidence
* Factors to consider when determining resource requirements for maintenance activity plan, including:
* Personnel in required numbers with applicable experience, qualifications and task authorization
* Spares
* Consumables
* Tools
* Special equipment
* Ground support equipment
* PPE
* Use of PPE
* Use and procedures for obtaining confined space entry permits
* Techniques to avoid maintenance errors
* Key features of the log of industrial experience and achievement, including responsibility for making entries and responsibility for certifying entries
* Role of supervisors in assisting workplace competency assessors
* Techniques for delivering on-the-job training.

**EVIDENCE GUIDE**

This provides advice on assessment and must be in conjunction with the performance criteria, required skills and knowledge and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency.
 | Assessment requires evidence that the candidate:* 1. Planned for avionic maintenance project
	2. Checked tools and support equipment are for serviceability and currency of calibration.
	3. Implemented avionic maintenance activities
	4. Allocated maintenance tasks to team members after consideration of individual experience, qualifications, and task authorisations
	5. Briefed team members on their responsibility and function
	6. Authorised team members are to operate required items of ground support and test equipment
	7. Monitored and certified avionic maintenance quality
	8. Checked maintenance activities and guided personnel to ensure that maintenance is performed and certified according to required documentation, policies, and procedures
	9. Performed check inspections on completed work or work stages and certified the work according to regulatory requirements, and policies and procedures
	10. Managed human resource activities
	11. Performed workplace avionic training tasks
 |
| 1. Resource Implications.
 | The following resources should be provided:1. Access to relevant workplace where assessment can take place
2. Appropriately simulated environment where assessment can take place
 |
| 1. Methods of Assessment.
 | Competency may be assessed through:* 1. Practical
	2. Observation
	3. Questionnaire
	4. Case studies
	5. Written examinations
	6. Oral presentation
 |
| 1. Context of Assessment.
 | Competency may be assessed 1. Off the job
2. on the job
3. During industrial attachment
 |
| 1. Guidance information for assessment.
 | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended |