



**Australian Government**

# **UEENEEH192A Develop solutions for air surveillance apparatus and systems**

**Release: 2**

# UEENEEH192A Develop solutions for air surveillance apparatus and systems

## Modification History

Not applicable.

## Unit Descriptor

### Unit Descriptor

#### 1) Scope:

##### 1.1) Descriptor

This unit covers development of engineering solutions for air surveillance apparatus and systems. The unit encompasses safe working practices, interpreting diagrams, applying logical engineering solution methods and knowledge of air surveillance apparatus and systems, safety and functional testing, and completing the necessary service documentation.

## Application of the Unit

### Application of the Unit 2)

This unit is intended as an additional competency to relevant competencies previously acquired. It is suitable for employment-based programs under an approved contract of training at the aligned AQF 5 level or higher.

## Licensing/Regulatory Information

### License to practice 3)

However other conditions may apply in some jurisdictions subject to regulations related to electrical work. Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as traineeship.

**License to practice****3)**

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

The skills and knowledge described in this unit may require a license to practice in the workplace where plant and equipment operate at voltage above 50 V a.c. or 120 V d.c.

**Pre-Requisites****Prerequisite Unit(s)****4)****Competencies****4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEH11 Find and repair microwave amplifier  
6A section faults in electronic apparatus

UEENEEH17 Troubleshoot communication systems  
2A

UEENEEH19 Provide engineering solutions to air traffic  
0A control system problems

**Literacy and numeracy skills****4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills

indicated by the following scales. Description of each scale is given in Volume 2, Part 3 ‘Literacy and Numeracy’

Reading 5      Writing 5      Numeracy 5

## Employability Skills Information

### Employability Skills 5)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

## Elements and Performance Criteria Pre-Content

<p>6) Elements describe the essential outcomes of a competency standard unit</p>	<p>Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.</p>
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## Elements and Performance Criteria

### ELEMENT

### PERFORMANCE CRITERIA

- |   |  |
|---|--|
| <p>1 Prepare to provide engineering solutions</p> | <p>1.1 OHS procedures for a given work area are obtained and understood.</p> <p>1.2 Operational safety procedures for a given work area are obtained and understood</p> <p>1.3 Established OHS risk control measures and procedures are followed in preparation for the work.</p> <p>1.4 Safety hazards that have not previously been identified are documented and risk control</p> |
|---|--|

**ELEMENT****PERFORMANCE CRITERIA**

		measures devised and implemented in consultation with appropriate personnel.
	1.5	The extent of problems is determined from reports and other documentation and from discussion with appropriate personnel.
	1.6	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved on the work site.
	1.7	Tools, equipment and testing devices needed to provide engineering problems are obtained in accordance with established procedures and checked for correct operation and safety.
2	Provide engineering solutions	
	2.1	OHS risk control measures and procedures for carrying out the work are followed.
	2.2	The need to test or measure live is determined in strict accordance with OHS requirements and when necessary conducted within established safety procedures.
	2.3	Circuits/machines/plant are checked as being isolated where necessary in strict accordance OHS requirements and procedures
	2.4	Logical diagnostic methods are applied to provide engineering solutions to problems in air surveillance apparatus and systems employing measurements and estimations of system operating parameters referenced to system operational requirements.
	2.5	Suspected problems scenarios are tested as being the source of system problems.
	2.6	Source of the fault is identified and appropriately competent persons are engaged to rectify the fault where it is outside the scope of electronics.
	2.7	Problems in the electronic components of the system are rectified to raise air surveillance and observation system to its operation standard.
	2.8	System is tested to verify that the system operates as intended and to specified

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	requirements.
	2.9 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements.
	2.10 Methods for dealing with unexpected situations are selected on the basis of safety and specified work outcomes.
	2.11 Rectification activities are carried out efficiently without waste of materials or damage to apparatus and the surrounding environment or services and using sustainable energy practices.
3 Complete and report engineering solutions activities	3.1 OHS work completion risk control measures and procedures are followed.
	3.2 Work site is made safe in accordance with established safety procedures.
	3.3 Engineering solutions for air surveillance apparatus and systems is documented in accordance with established procedures
	3.4 Appropriate person or persons notified, in accordance with established procedures, that the system faults have been rectified.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices, engineering solutions air surveillance and observation systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

#### **KS01-EH192A**

#### **Electronic communications air surveillance systems**

Evidence shall show an understanding of electronic communications - air surveillance systems to an extent indicated by the following aspects:

T1 Basic Radar Principles encompassing:

- requirement of surveillance to support efficient, safe and effective ATC operations
- aircraft aspects
- basic radar history
- electromagnetic waves
- radiation hazards and OHS considerations
- radar principles of operation
- types of radar and radar block diagram
- main inputs and outputs for designated blocks of a given diagram
- requirement for redundancy
- go / nogo concept
- radar performance limitations
- different types of radar self testing
- surveillance- original environment, developing environment
- surveillance users
- radar locations and radar coverage map

T2 Principles of operation of a Primary Surveillance Radar (PSR) encompassing:

- purpose of a PSR
- principles of radar blind speed and measures to overcome this
- why radars use pulse compression and list the types of modulation used
- diversity operation is used in Primary radars
- radiation pattern for a 'cosec<sup>2</sup>' and slotted waveguide antenna
- radars use high / low coverage
- features of Primary radars currently in service

T3 Principles of operation of a Classical Secondary Surveillance Radar (SSR) encompassing:

- similarities and differences between PSR and SSR

## REQUIRED SKILLS AND KNOWLEDGE

- requirement to use wobulation
- relevant ICAO (Annex 10) specifications
- modes of operation
- transponder special replies and their functions
- SSR radiation patterns
- reasons for “No Reply” from an aircraft
- define garbling
- define FRUIT
- function of a Site Monitor
- advantages and disadvantages of SSR over primary radar
- features of classical SSRs

T4 Principles of operation of a Mode S Secondary Surveillance Radar encompassing:

- improvements Mode S has over classical SSR
- ICAO requirements relating to the use of aircraft addresses and Interrogator Codes
- purposes of All-call and roll-call interrogations
- principles of acquiring aircraft
- users of Mode S Transponders quitter
- protocols used to reduce FRUIT
- principles of All-call Lockouts and Lockout Overrides
- requirement for Classical SSR and Mode S SSR compatibility
- benefits to a controller of using elementary and enhanced surveillance
- features of Mode S SSRs

T5 Principles of operation of Radar Track Processors encompassing:

- function of radar track processor currently in service

T6 Principles of operation of Radar RCMS

- requirement for radar RCMS
- Radar RCMS network layouts

T7 Principles of operation of ADS encompassing:

- principles of operation of ADS-B
- aircraft data transmitted by ADS-B
- aircraft ADS-B transmission rates
- principles of operation of ADS-C

T8 Principles of operation of Multilateration encompassing:

- introduction, definition and history of Multilateration
- TDOA concepts
- Airport / local area concept
- Airborne / wide area concept



## REQUIRED SKILLS AND KNOWLEDGE

- Data and identification
- Surveillance strategies
- MLAT coverage
- principles of operation of MLAT
- message formats used by MLAT systems
- similarities and differences between MLAT and ADS-B systems

T9 Principles of Surveillance Track Messages encompassing:

- requirement for duplicated data paths
- ATS Centre processing and displaying of surveillance tracks
- contents of data messages sent from radar sites
- contents of data messages sent from ADS-B radar sites

T10 Principles of ACAS/TCAS encompassing:

- purpose and types of ACAS/TCAS
- function of ACAS/TCAS
- how ACAS/TCAS acquires and tracks aircraft
- ICAO requirements with respect to complying with RAs

T11 Performance characteristics and checks encompassing:

- measurement of radar PRF
- measurement of radar pulse shape / timing check
- measurement of radar transmitter frequency
- performing radar spectrum check
- identification of radar performance with or outside documented performance limits

## Evidence Guide

### EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

#### Overview of Assessment 9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

**Critical aspects of evidence required to demonstrate competency in this unit 9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Provide solutions in air surveillance apparatus and systems as described in 8) and including:
    - a. Applying logical diagnostic methods.
    - b. Using test equipment to test the apparatus and system
    - c. Identifying problems and competency needed to provide solutions
    - d. Implementation of solutions
    - e. Verifying that the system operates correctly.

- f. Documenting engineering solutions.
- g. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

**Context of and specific resources for assessment** 9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to providing engineering solutions for air surveillance apparatus and systems.

**Method of assessment** 9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires

that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent  
assessment and  
relationship with  
other units**      **9.5)**

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to this unit.

## Range Statement

### RANGE STATEMENT

**10)** This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated by diagnosing and rectifying at least four engineering solutions in a representative range of electronic air surveillance and observation systems.

Primary Surveillance Radar (PSR)

Secondary Surveillance Radar (SSR)

Mode S Secondary Surveillance Radar

Radar Track Processors

Radar RCMS

ADS

Multilateration

Surveillance Track Messages

ACAS/TCAS

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

## Unit Sector(s)

Not applicable.

## Competency Field

**Competency Field**            **11)**

Electronics