



Australian Government

UEEEEC0020 Develop solutions for air surveillance apparatus and systems

Release: 1

UEEEEC0020 Develop solutions for air surveillance apparatus and systems

Modification History

Release 1. This is the first release of this unit of competency in the UEE Electrotechnology Training Package.

Application

This unit involves the skills and knowledge required to develop engineering solutions for air surveillance apparatus and systems in compliance with relevant regulatory requirements of the Civil Aviation Safety Authority (CASA) and national operating standards.

It includes working safely, interpreting diagrams, applying logical engineering solution methods of air surveillance apparatus and systems, conducting safety inspections and functional testing, and completing the necessary service documentation.

Permits may be required for some work environments, such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

UEEEEC0038 Find and repair microwave amplifier section faults in electronic apparatus

UEEEEC0068 Troubleshoot communication systems

UEEEEC0053 Provide engineering solutions to air traffic control system problems

Competency Field

Electronics and Communications

Unit Sector

Electrotechnology

Elements and Performance Criteria

ELEMENTS

PERFORMANCE CRITERIA

Elements describe the essential Performance criteria describe the performance needed to

outcomes.

demonstrate achievement of the element.

1 Identify air surveillance apparatus and system problems

- 1.1** Work health and safety (WHS)/occupational health and safety (OHS) requirements and workplace procedures for a given work area are identified and applied
- 1.2** Operational safety workplace procedures for air surveillance work areas are obtained and applied
- 1.3** WHS/OHS risk control measures and workplace procedures are followed in preparation for work activities
- 1.4** Safety hazards that have not previously been identified are documented on job safety assessments, risks assessed and control measures devised and implemented in consultation with appropriate person/s
- 1.5** Extent of air surveillance apparatus problems is determined from reports, diagrams, relevant documentation and discussions with appropriate person/s
- 1.6** Appropriate person/s is consulted to ensure the work activity is coordinated effectively with others
- 1.7** Tools, equipment, inspection and testing devices needed to provide engineering diagnosis are obtained in accordance with workplace procedures and checked for correct operation and safety

2 Provide air surveillance apparatus and systems engineering solution

- 2.1** WHS/OHS risk control measures and workplace procedures for carrying out work activities are followed
- 2.2** Need to inspect, test and measure live work is determined in accordance with WHS/OHS requirements and conducted within workplace safety procedures
- 2.3** Circuits/machines/plant are checked and isolated in accordance with WHS/OHS requirements and workplace procedures
- 2.4** Logical diagnostic methods are applied to provide engineering solutions to problems in air surveillance apparatus and systems using measurements and estimations of system operating parameters with reference to system operational requirements

- 2.5 Suspected air surveillance problem scenarios are tested to determine the source of system problems
 - 2.6 Source of the fault is identified and an appropriately competent person/s engaged to rectify the fault in accordance with workplace procedures
 - 2.7 Problems in the electronic components of the system are rectified in accordance with air surveillance and observation system operation standards
 - 2.8 Air surveillance system is inspected and tested to verify that the system operates as intended and to specified requirements
 - 2.9 Unplanned situations are responded to in accordance with workplace procedures in a manner that minimises risk to personnel and equipment
 - 2.10 Decisions for dealing with unexpected situations are made from discussions with appropriate persons and job specifications and requirements
 - 2.11 Rectification activities are carried out efficiently without waste of materials or damage to apparatus, the surrounding environment or services using sustainable energy practices
- 3 Complete and report air surveillance apparatus and system engineering solution activities**
- 3.1 WHS/OHS work completion risk control measures and workplace procedures are followed
 - 3.2 Worksite is made safe in accordance with workplace safety procedures
 - 3.3 Engineering solutions for air surveillance apparatus and systems are documented in accordance with workplace procedures
 - 3.4 Appropriate person/s is notified in accordance with workplace procedures that the system faults have been rectified

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Range is restricted to essential operating conditions and any other variables essential to the work environment.

Non-essential conditions may be found in the UEE Electrotechnology Training Package Companion Volume Implementation Guide.

Diagnosing and rectifying engineering solutions in air surveillance and observation systems must include at least the following:

- two engineering solutions in two of the following:
 - primary surveillance radar (PSR)
 - secondary surveillance radar (SSR)
 - mode S SSR
 - radar track processors
 - radar remote control monitoring system (RCMS)
 - air defence system (ADS)
 - multilateration (MLAT)
 - surveillance track messages
 - airborne collision avoidance system (ACAS)/traffic alert and collision avoidance system (TCAS)

Unit Mapping Information

This unit replaces and is equivalent to UEENEEH192A Develop solutions for air surveillance apparatus and systems.

Links

Companion Volume implementation guides are found in VETNet - -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b8a8f136-5421-4ce1-92e0-2b50341431b6>

Assessment Requirements for UEEEC0020 Develop solutions for air surveillance apparatus and systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions on at least one occasion and include:

- applying logical diagnostic methods
- using test equipment to test the apparatus and system
- identifying problems and competency needed to provide solutions
- implementation of solutions
- verifying that the system operates correctly
- documenting engineering solutions
- dealing with unplanned events
- applying sustainable energy principles and practices
- creating test scenarios in developing engineering solutions for air surveillance apparatus and systems
- performing radar spectrum check
- providing solutions in air surveillance apparatus and systems.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements, performance criteria and range of conditions and include knowledge of:

- electronic communications air surveillance systems, including:
 - basic radar principles encompassing:
 - requirement of surveillance to support efficient, safe and effective air traffic control (ATC) operations
 - aircraft aspects
 - basic radar history
 - electromagnetic waves
 - radiation hazards and work health and safety (WHS)/occupational health and safety (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/no-go concept
- radar performance limitations
- different types of radar self- testing
- surveillance- original environment and developing environment
- surveillance users
- radar locations and radar coverage map
- 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 the types of modulation used
 - diversity operation is used in Primary radars
 - radiation pattern for a ‘cosec²’ and slotted waveguide antenna
 - radars use high / low coverage
 - features of primary radars currently in service
- principles of operation of a classical secondary surveillance radar (SSR) encompassing:
 - similarities and differences between PSR and SSR
 - requirement to use wobulation
 - relevant International Civil Aviation Organisation (ICAO) (Annex 10) specifications
 - modes of operation
 - transponder special replies and their functions
 - SSR radiation patterns
 - reasons for “No Reply” from an aircraft
 - definition of garbling
 - definition of false replies unsynchronised in time (FRUIT)
 - function of a site monitor
 - advantages and disadvantages of SSR over primary radar
 - features of classical SSRs
- principles of operation of a mode S SSR 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
- principles of operation of radar track processors encompassing:
 - function of radar track processor currently in service
- principles of operation of radar remote control monitoring system (RCMS):
 - requirement for RCMS
 - RCMS network layouts
- principles of operation of air defence system (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
- principles of operation of multilateration (MLAT) encompassing:
 - introduction, definition and history of MLAT
 - TDOA concepts
 - airport/local area concept
 - airborne/wide area concept
 - 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
- 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
- principles of airborne collision avoidance system (ACAS)/traffic alert and collision avoidance system (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
- performance characteristics and checks encompassing:
 - measurement of radar performance
 - 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

- relevant apparatus manufacturer specifications
- relevant Civil Aviation Safety Authority (CASA) national operating standards, and workplace policies and procedures
- relevant job safety assessments or risk mitigation processes
- relevant WHS/OHS requirements
- relevant workplace documentation.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment

Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated workplace operational situations that replicate workplace conditions.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Resources for assessment must include access to:

- a range of relevant exercises, case studies and/or other simulations
- relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry
- resources that reflect current industry practices in relation to providing engineering solutions for air surveillance apparatus and systems
- applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals.

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