



Australian Government

MEA706 Apply basic scientific principles and techniques in avionic engineering situations

Release: 1

MEA706 Apply basic scientific principles and techniques in avionic engineering situations

Modification History

Release 1 - New unit of competency

Application

This unit of competency requires application of basic avionic scientific principles and techniques as a member of a design and development team or similar in support of the design and development of avionic applications, or as a member of a maintenance organisation engineering department.

Applications include identifying the range of basic avionic scientific principles and techniques relevant to avionic engineering, selecting avionic principles and techniques for particular applications, applying avionic principles and techniques to engineering tasks, and quoting results appropriately.

This unit is used in workplaces that operate under the airworthiness regulatory systems of the Australian Defence Force (ADF) and the Civil Aviation Safety Authority (CASA).

Pre-requisite Unit

MEM23004A Apply technical mathematics

Competency Field

Avionic engineering

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
1.	Research and identify the range of basic scientific principles and techniques relevant to avionic engineering	1.1	Research appropriate sources of information
		1.2	Examine applications and report on the basic scientific principles relating to avionic engineering
		1.3	Identify basic avionic techniques and associated technologies, software and hardware required to

			implement scientific principles relating to avionic engineering situations
2.	Select basic avionic scientific principles and techniques relevant to particular avionic engineering applications	2.1	Select the relevant basic avionic scientific techniques and principles for particular avionic engineering situations
		2.2	Select the relevant basic avionic techniques and associated technologies, software and hardware for particular avionic engineering situations
3.	Apply the relevant basic avionic scientific principles and techniques	3.1	Apply the basic avionic scientific principles in a consistent and appropriate manner to obtain any required solution
		3.2	Use appropriate calculations and coherent units in the solution of engineering calculations
		3.3	Use significant figures in engineering calculations
		3.4	Apply the basic avionic techniques and associated technologies, software and hardware in a consistent and appropriate manner to obtain required solutions
4.	Quote the results of the application of the basic avionic scientific principles and basic techniques	4.1	Use an appropriate style to quote solutions for applications involving engineering calculations
		4.2	Use an appropriate style to quote solutions for applications not involving engineering calculations

Foundation Skills

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

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Sources of information include:

- Reference texts
- Manufacturer catalogues and industry magazines
- International aerospace organisation publications
- Websites

Avionic engineering refers to:

- Use of phone, email and fax information gathering
- The engineering discipline concerned with the conceptual development, research, design, manufacture, implementation, installation, commissioning and maintenance of aerospace electrical, instrument, radio and electronic systems and components and related test equipment for civil and military applications

Basic avionic scientific techniques and principles involves:

- The application of appropriate basic techniques (see below) supported by their mathematical skills and introductory knowledge of scientific principles to design, manufacturing, commissioning and maintenance-related tasks and projects relating to:
 - electrical systems and related wiring and components (power generation, distribution, control interfaces with hydraulic and pneumatic systems, and caution and warning systems)
 - mechanical and electro-mechanical flight instruments and indication systems (quantity, pressure, temperature and position) and components
 - electronic systems and components (communications, radio navigation, pulse, display, automatic flight control, flight management and engine management)
 - automatic test stations, adapters and software
- The applications may require the use of one or two basic avionic scientific principles together with a fundamental mathematical calculation leading to process, resources and system choices from a limited range of options.
- Basic techniques include:
 - basic hand and power tool operations
 - machining
 - fitting
 - welding
 - moulding
 - fabricating
 - wiring
 - programming techniques

Unit Mapping Information

Release 1 – supersedes and is equivalent to MEA272B Apply basic scientific principles and techniques in avionic engineering situations

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ce216c9c-04d5-4b3b-9bcf-4e81d0950371>

Assessment Requirements for MEA706 Apply basic scientific principles and techniques in avionic engineering situations

Modification History

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Performance Evidence

Evidence required to demonstrate competency in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria under the specified conditions of assessment, and must include:

- selecting appropriate basic avionic scientific principles to suit specific applications
- selecting appropriate basic avionic techniques and associated technologies, software and hardware to suit specific applications
- applying basic avionic scientific principles to particular engineering situations
- applying and manipulating appropriate formulas for applications involving engineering calculations
- applying appropriate calculations to engineering situations
- checking the validity of equations using dimensional analysis
- applying basic avionic techniques and associated technologies, software and hardware in a manner appropriate to the application and identified scientific principles
- referring solutions to the original aim of the application
- quoting solutions in appropriate units, using appropriate significant figures
- quoting limitations of solutions, due to assumptions, scientific principles and techniques used
- presenting solutions referring to the original aim of the application.

Knowledge Evidence

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

- physics for electronics:
 - units and measurements
 - magnetic force
 - vectors
 - electric fields and potential
 - electric current and resistance
 - capacitance
 - work, power and energy
- analogue electronics:
 - negative feedback amplifiers

- differential amplifiers
- operational amplifiers
- amplifier frequency response
- thermal circuits/heat exchangers
- active filters
- fault-finding
- digital electronics:
 - characteristics of digital systems
 - number systems
 - Boolean algebra
 - logic circuits
 - logic families
 - construction and testing techniques
 - flip flop circuits
 - analogue to digital conversion
 - digital to analogue conversion
 - timing and control
 - combinational logic circuits
- circuit theory:
 - Kirchhoff's Current and Voltage Laws
 - Thevenin's Network Theorem
 - Norton's Network Theorem
 - Superposition Network Theorem
 - inductance, capacitance and resistance (LCR) series circuit analysis
 - LCR parallel circuit analysis
 - series and parallel resonance
- electrical systems:
 - DC and AC circuit design principles
 - generators and motors
 - inverters
 - power supply, transformer, rectifier, filter and regulator
 - solenoids
 - circuit protection
 - wiring cables and looms
- aerodynamics:
 - Bernoulli's Theorem
 - the atmosphere
 - aerodynamic forces (lift, drag, weight and thrust)
 - stability and control (to a level not requiring the application of calculus)
- thermodynamics – heat transfer principles (conduction, convection and radiation)

- instruments:
 - airspeed measurement
 - altitude measurement
 - attitude indication
 - measurement of quantity, flow, temperature, pressure and position
- control concepts and data communications:
 - servo and synchronous systems and components
 - data communication definitions and terminology
- communications:
 - radio transmission and modulation
 - radio reception
 - microphones, amplifiers and speakers
 - transmission lines and antennas
- pulse:
 - antennas
 - waveguides
 - transmitters/receivers
 - displays
- light, sound and vibration:
 - wave behaviour – standing vs travelling waves, transverse and longitudinal
 - light – reflection, absorption, refraction, diffraction, spectrum, infrared, visible, ultraviolet (UV), transmission medium and engineering applications
 - sound – pitch, frequency, intensity (power), decibel scale, ‘noise dose’, spectrum, infrasound, audible, ultrasound, speed, natural frequency, resonance, transmission medium and engineering applications
 - vibration – sources, balancing, shaft alignment, measurement, damping and engineering applications
- appropriateness of calculations
- fundamental and derived quantities
- the procedure for carrying out dimensional analysis
- the concept of significant figures
- the uncertainty of computations based on experimental data
- the procedures for determining the significance of figures in calculations
- the procedures for estimating errors in derived quantities.

Assessment Conditions

- This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is, the candidate is not in productive work, then a simulated working environment must be used that reflects realistic workplace situations and conditions.

- The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.
- Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
- Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application.
- Assessment may be applied under project related conditions (real or simulated) and require evidence of process.
- Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
- Assessors must be satisfied that the candidate can competently and consistently:
 - identify and explain the application of basic scientific principles and engineering techniques to avionic engineering situations
 - for given avionic engineering situations, identify and apply the relevant basic scientific principles and techniques
 - perform necessary calculations using appropriate applications and evaluate solutions
 - document appropriately the outcome of application of basic scientific principles and techniques to given avionic engineering situations.
- Assessment may be in conjunction with assessment of other units of competency where required.
- Assessors must satisfy the requirements of the National Vocational Education and Training Regulator (Australian Skills Quality Authority, or its successors).

Links

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