



Australian Government

MEAENG0001 Apply basic scientific principles and techniques in aeronautical engineering situations

Release: 1

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Modification History

Release 1. Application changed. Elements and Performance Criteria changed. Foundation Skills made explicit. Range of Conditions removed, and relevant information moved to Assessment Requirements. Assessment Requirements clarified. Supersedes and is equivalent to MEA705 Apply basic scientific principles and techniques in aeronautical engineering situations.

Application

This unit describes the skills and knowledge required to identify and apply basic aeronautical scientific principles and techniques to aeronautical engineering situations. This includes identifying the range of aeronautical scientific principles and techniques, selecting aeronautical principles and techniques for applications, applying aeronautical principles and techniques to engineering tasks, and quoting results appropriately.

This unit applies to members of a design and development team or similar who support the design and development of aeronautical applications or to those working within the engineering department of an aircraft maintenance organisation.

The unit is used in workplaces that operate under the airworthiness regulatory systems of the Civil Aviation Safety Authority (CASA) and the Defence Aviation Safety Authority (DASA).

Any other relevant legislation, industry standards and codes of practice within Australia must be applied.

Pre-requisite Unit

MEM23004A Apply technical mathematics

Competency Field

Aeronautical engineering

Elements and Performance Criteria

Elements	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	1.1 Research and report on the basic scientific principles relating to aeronautical engineering from appropriate sources of information and examination of applications

techniques	1.2 Identify the basic aeronautical techniques and associated technologies, software and hardware required to implement scientific principles relating to aeronautical engineering situations
2. Select aeronautical scientific principles and techniques	2.1 Select the relevant basic aeronautical scientific techniques and principles for aeronautical engineering situations 2.2 Select the associated technologies, software and hardware for particular aeronautical engineering situations
3. Apply the basic aeronautical scientific principles and techniques	3.1 Apply the basic aeronautical scientific principles in a consistent and appropriate manner to obtain 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 aeronautical 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 aeronautical scientific principles and basic techniques	4.1 Quote the solution for applications involving engineering calculations in accordance with organisation style requirements 4.2 Quote the solution for applications not involving engineering calculations in accordance with organisation style requirements

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance but not explicit in the performance criteria.

- Numeracy skills to quote solutions and use engineering calculations.

Other foundation skills essential to performance are explicit in the performance criteria of this unit.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEA705 Apply basic scientific principles and techniques in aeronautical engineering situations.

Links

Companion Volume Implementation Guides are found in VETNet -

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

Assessment Requirements for MEAENG0001 Apply basic scientific principles and techniques in aeronautical engineering situations

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Performance Evidence

There must be evidence the candidate has completed all the tasks outlined in the elements and performance criteria of this unit, and demonstrated the ability to apply basic scientific principles and techniques in at least two aeronautical engineering situations using any of the following relevant basic aeronautical scientific techniques and principles:

- basic hand and power tool operations
- machining
- fitting
- welding
- moulding
- fabricating
- wiring
- programming techniques.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- basic aeronautical scientific principles including applicability and limitations
- statics, including analysis and application of:
 - forces and moments of forces
 - systems of concurrent and non-concurrent forces
 - dry sliding friction
- sources of information
- quotation style requirements
- basic techniques of avionic engineering, including:
 - basic hand and power tool operations
 - machining
 - fitting
 - soldering

- welding
- moulding
- fabricating
- wiring
- programming techniques
- dynamics, including analysis and application of:
 - Newton's Laws
 - kinematics and kinetics of uniformly accelerated linear motion
 - kinematics and kinetics of uniformly accelerated rotation
 - curvilinear motion and centrifugal force
 - work, energy, power and torque
 - mechanical advantage and efficiency
- strength of materials:
 - axial tension and compression
 - direct shear
 - bolted, riveted, bonded and welded connections
 - shear in beams
 - bending stresses and bending deflections (by standard formulas only)
 - torsion
- 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)
 - propellers and propulsion (to a level not requiring the application of calculus)
 - aircraft performance (to a level not requiring the application of calculus)
- fluid mechanics:
 - properties of fluids, including mineral and synthetic hydraulic fluids
 - fluid statics, Archimedes' Principle and Pascal's Principle
 - fluid flow – continuity and energy conservation
 - fluid power – pumps
- thermodynamics:
 - heat transfer principles (conduction, convection and radiation)
 - perfect gas laws
 - kinetic theory of gases
 - laws of thermodynamics
- control concepts including closed and open loop control
- electricity and electronics:
 - basic electrical concepts
 - Ohm's Law

- Kirchhoff's Current and Voltage Laws
- basic direct current (DC) circuits
- basic power supply, transformer, rectifier, filter and regulator
- programmable logic controller (PLC) concepts – I/O, timing, counting, programming
- electronic devices (discrete) – resistors, diodes, capacitors, inductors, transistors and rectifiers
- microprocessor concepts
- light, sound and vibration:
 - wave behaviour – standing vs travelling waves, transverse and longitudinal
 - light – reflection, absorption, refraction, diffraction, spectrum, infrared, visible, ultraviolet, 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
- basic aeronautical techniques and related technologies, software and hardware associated with implementing scientific principles in aeronautical engineering solutions
- the applicability and limitations of basic aeronautical techniques and associated technologies, software and hardware
- calculations, including when to use
- fundamental and derived quantities
- common systems of units
- common prefixes used with units and their values
- the concept of significant figures
- the uncertainty of computations based on experimental data
- procedures for:
 - researching and reporting
 - converting between systems of units
 - carrying out dimensional analysis
 - determining the significance of figures in calculations
 - for estimating errors in derived quantities.

Assessment Conditions

The following conditions of assessment represent the requirements of the regulators Defence Aviation Safety Authority (DASA) and Civil Aviation Safety Authority (CASA) and maintenance stakeholders and must be rigorously observed.

Skills must have been demonstrated under routine supervision in the workplace or in a simulated environment that reflects workplace conditions and contingencies encountered in aeronautical engineering situations. The following conditions must be met for this unit:

- use of suitable facilities, equipment and resources, including workplace procedures, manufacturing specifications, codes, standards, manuals, and reference materials relevant to aeronautical engineering situations.

Evidence of tasks demonstrating competency must be recorded in a log of industrial experience and achievement.

Assessors must satisfy the NVR/AQTF mandatory competency requirements for assessors.

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