



Australian Government

Department of Education, Employment and Workplace Relations

MEM23084A Apply scientific principles and techniques in aeronautical engineering situations

Release: 1

MEM23084A Apply scientific principles and techniques in aeronautical engineering situations

Modification History

Not applicable.

Unit Descriptor

This unit of competency covers applying advanced scientific principles to aeronautical engineering situations

Application of the Unit

This unit applies to selecting and applying advanced aeronautical scientific principles and techniques. Computer techniques, graphical methods and mathematical calculations should complement scientific principles. Unit analysis, appropriate precision and accuracy and use conservative estimations.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEA349A	Apply basic scientific principles and techniques in aeronautical engineering situations
MEM23052A	Apply basic electro and control scientific principles and techniques in aeronautical engineering situations

Employability Skills Information

This unit contains employability skills

Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

1	Identify the range of aeronautical scientific principles and techniques relevant to aeronautical engineering	1.1	Research and report on aeronautical scientific principles and techniques relevant to aeronautical engineering using appropriate sources of information
		1.2	Research and report on aeronautical techniques and associated software and hardware associated with implementing solutions relating to aeronautical engineering applications using appropriate information
2	Select scientific principles and techniques relevant to aeronautical engineering applications	2.1	Select the relevant scientific principles for particular aeronautical situations
		2.2	Select the relevant aeronautical techniques and associated software and hardware for particular aeronautical engineering applications
3	Apply the relevant scientific principles and techniques appropriately	3.1	Apply the scientific principles in a consistent and appropriate manner to obtain any required solution
		3.2	Use appropriate calculations and correct units to establish solutions
		3.3	Use coherent units in equations in a systematic manner to establish solutions
		3.4	Use significant figures in engineering calculations
		3.5	Apply the 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 aeronautical scientific principles and techniques correctly	4.1	Quote solutions for applications involving engineering calculations in an appropriate style
		4.2	Quote solutions for applications not involving engineering calculations in an appropriate style

Required Skills and Knowledge

Required knowledge includes:

- aeronautical techniques and related technologies, software and hardware associated with implementing scientific and engineering solutions and related to appropriate engineering applications. Principles include:
 - physics:
 - momentum and center of gravity
 - gravity
 - circular motion
 - orbital motion
 - rotational motion
 - oscillation and simple harmonic motion
 - digital electronics:
 - logic circuits
 - logic families
 - construction and testing techniques
 - flip flop circuits
 - analogue to digital conversion
 - digital to analogue conversion
 - timing and control
 - circuit analysis
 - stress analysis:
 - 2D force systems
 - equilibrium in 2D
 - plane trusses
 - plane frames and machines
 - 3D force systems
 - equilibrium in 3D
 - space trusses and frames
 - properties of areas
 - engineering concepts of stress and strain
 - axial force and deformation
 - shear force and deformation
 - thin walled pressure vessels
 - 2D stress
 - 2D strain
 - relationship between elastic constants
 - joints
 - instability
 - stress concentration

- mechanics of flight:
 - boundary layer calculations relating to drag coefficient and skin friction
 - lift augmentation
 - thrust and power available
 - range and endurance
 - static stability
 - supersonic aerodynamics
 - rotary wing aerodynamics
- aircraft dynamic stability:
 - states of stability
 - the aerodynamic derivatives employed in the aircraft equations of motion
 - aircraft longitudinal stability
 - lateral dynamic stability
 - control mechanisms
 - aeroelastic effects
- aircraft mechanisms:
 - friction mechanisms
 - linkages
 - bearings
 - gear mechanisms
 - mechanical vibration
 - static and dynamic balancing
- limitations of aeronautical techniques and associated technologies, software and hardware
- relevance of scientific principles to aeronautical engineering
- applicability and limitations of an extensive range of aeronautical techniques and associated technologies,
- choice of aeronautical scientific principles for particular applications
- applicability of particular aeronautical techniques and associated technologies, software and hardware to s
- choice of aeronautical techniques and associated technologies, software and hardware for particular applic
- the method of application of the scientific principles
- fundamental and derived quantities
- common systems of units
- the procedure for converting between systems of units
- common prefixes used with units and their values
- the procedure for ensuring coherent units for meaningful solutions to equations
- the concept of significant figures
- the uncertainty of computations based on experimental data
- procedures for determining the significance of figures in calculations
- procedures for estimating errors in derived quantities
- the method of application of the aeronautical techniques and associated technologies, software and hardw
- significance of the calculation solution style in relation to the original task
- significance of the non-calculation solution style in relation to the original task

Required skills include:

- applying advanced scientific principles relevant to aeronautical engineering
- analysing the given situation to determine what is required in the manner of a solution
- analysing the given situation to determine which aeronautical scientific principles are selected
- selecting appropriate aeronautical techniques and associated technologies, software and hardware to suit a
- applying appropriate aeronautical principles in determining the required solution
- applying and manipulating formulas and calculations for engineering applications
- using the correct units to solve engineering calculations
- checking the validity of equations using a systematic method for ensuring coherent units
- applying aeronautical techniques and associated technologies, software and hardware in a manner appropriate and identified scientific principles
- referring solutions to the original aim of the application
- quoting solutions in appropriate units and using appropriate significant figures
- presenting solutions referring to the original aim of the application

Evidence Guide

Overview of assessment	A person who demonstrates competency in this unit must be able to apply scientific principles and techniques in aeronautical engineering situations. Competency in this unit cannot be claimed until all prerequisites have been satisfied.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts. Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency.
Context of and specific resources for assessment	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 an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Method of assessment	This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying scientific principles and techniques in aeronautical engineering situations or other units requiring the exercise of the skills and knowledge covered by this unit.
Guidance information for assessment	

Range Statement

Aeronautical engineering	Aeronautical engineering refers to: <ul style="list-style-type: none">the engineering discipline concerned with the conceptual development, research, design, manufacture, implementation, installation, commissioning and maintenance of aerospace mechanical, hydraulic, pneumatic, fuel and fire products, processes, systems or services for civil and military applications
Sources of information	Sources of information includes: <ul style="list-style-type: none">reference textsmanufacturer catalogues and industrial magazineswebsitesuse of phone, email and fax information gathering
Aeronautical engineering applications	Aeronautical engineering applications refer to: <ul style="list-style-type: none">the description or definition of an objective or challenge within a real or simulated engineering environment or state requiring a conceptual development, design, manufacture and/or implementation and/or installation, commissioning and maintenance response to affect a solution or improvement with regard to:<ul style="list-style-type: none">airframe structure including power plant support structuremechanical systems, including flight controlshydraulic systems, including powered flight controlspneumatic systems, including pressurisation and air conditioning systemsthe interfaces between hydro-mechanical systems, including engine controls, and electrical and electronic control systemsthe interface between hydro-mechanical flight control systems and automatic flight control systems

Unit Sector(s)

Engineering science

Custom Content Section

Not applicable.