



Australian Government

MEA701 Produce aeronautical engineering related graphics

Release: 2

MEA701 Produce aeronautical engineering related graphics

Modification History

Release 2. Equivalent to MEA701 Produce aeronautical engineering related graphics with amended prerequisite codes.

Application

This unit of competency applies to aircraft structure and to aircraft systems products, projects, and related system modifications. It is suitable for people working in aeronautical related design, drafting and maintenance support at the paraprofessional level.

The unit covers the application of graphical techniques for aeronautical engineering related purposes. Graphics techniques include sketching, computer graphics and the application of drawing standards.

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

MEA162	Write aviation technical publications
MEM30007A	Select common engineering materials
MEM30012A	Apply mathematical techniques in manufacturing, engineering or related situations

Competency Field

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Review the fundamentals of engineering graphics for aeronautical applications	1.1 Review uses for aeronautical graphics
	1.2 Review engineering drawing standards
	1.3 Review graphical imaging or modelling techniques and conventions

- 1.4 Review conventional representations of structure and of mechanical, hydraulic and pneumatic features and components, including related electrical and electronic control circuits
 - 1.5 Review computer-aided design (CAD) and other related software for currency and relevance
 - 1.6 Check and determine relevance of work health and safety (WHS) and regulatory requirements, codes of practice, risk assessment and registration requirements for graphical representation tasks
 - 1.7 Confirm the availability and features of a range of standards related to aircraft structure and aeronautical system and component design, maintenance and modification
 - 1.8 Review typical criteria for aeronautical designs
2. Apply aeronautical graphics
 - 2.1 Determine engineering graphics required by aeronautical applications
 - 2.2 Apply relevant standards
 - 2.3 Represent aircraft structure and aeronautical components and systems with sketching and computer graphical techniques, including orthogonal, three-dimensional imaging, wiring diagrams, circuit diagrams and system schematic drawings
 - 2.4 Determine and apply required dimensioning, tolerancing for limits and fits, surface finish, weld symbols, electrical, electronic and other required graphical convention information appropriate to aeronautical engineering applications
 - 2.5 Seek technical and professional assistance or clarification of design information as required
 - 2.6 Confirm final graphical representations with professional engineering staff and other stakeholders, including making any required adjustments
 - 2.7 Engage appropriate licensed technical and professional assistance for advice as required

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| 3. Provide final drawings, files and documents | 3.1 Provide documentation, graphics, data files and clearances according to job requirements and regulatory and enterprise drawing management system and procedures |
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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.

Criteria for aeronautical designs include:

- Function
- Design authority regulatory requirements
- Aircraft design specifications
- Application of configuration management (CM) and/or integrated logistic support (ILS) requirements

Configuration management (CM)

- CM is a process for control and documentation of the design and development process and for the management of system, component and software throughout the service life

Integrated logistic support (ILS)

- ILS is an integrated approach to the management of logistic disciplines originally developed for the management of military systems from design concept to final disposal at life-of-type. It covers:
 - reliability engineering, maintainability engineering and maintenance planning
 - supply and support
 - support and test equipment
 - manpower and personnel
 - training and training support
 - technical data and publications
 - computer resources support
 - facilities
 - packaging, handling, storage and transportation
 - design interface

Features, functions and context of engineering

- Uses of graphics for purposes, such as:

graphics include:

- design specifications
- production specifications
- maintenance procedures
- technical specifications and descriptions
- Graphical representation techniques, including orthogonal, 2-D and 3-D modelling, isometric and mechanical perspective, dimensioning, limits and fits, welding and other standard symbols
- Role of WHS and regulatory requirements, codes of practice, risk assessment and registration requirements
- Availability and features of a range of standards related to aircraft structure and system design, maintenance and modification
- Typical criteria for aeronautical designs
- Software developments
- Current graphical methods compared with traditional methods
- Emerging developments in graphics and related engineering software

Aeronautical systems and components include:

- Structure and structural components
- Mechanical systems and components
- Hydraulic systems and components
- Pneumatic systems and components
- Fuel systems and components
- Power plants (engines and engine systems and components)
- Standard fasteners and locking systems
- Electrical
- Electronic
- Automatic flight and automatic engine control interface

Appropriate technical and professional assistance includes:

- Assistance from individuals with Civil Aviation Safety Authority (CASA) maintenance certification licenses or those with supervisory authorisations in the Australian Defence Force (ADF) regulatory system
- Professional support from engineers employed within:
 - organisations with CASA design, continuing airworthiness management or maintenance approvals
 - approved engineering organisations under the ADF regulatory system
- Engineers employed within organisations recognised by overseas airworthiness organisations

WHS, regulatory requirements and enterprise

- WHS Acts and regulations
- Relevant standards

procedures include:

- Industry codes of practice
- Risk assessments
- Registration requirements
- Safe work practices
- State and territory regulatory requirements applying to electrical work

Aviation regulatory requirements include:

- Civil Aviation Safety Regulations (CASRs)
- AAP7001.053 ADF Technical Airworthiness Management Manual
- Overseas airworthiness authorities where applicable e.g. Federal Aviation Administration, Transport Canada, European Aviation Safety Agency

Relevant standards include:

- AS 1100.101-1992 Technical drawing – General principles
- AS 1102.101-1989 Graphical symbols for electrotechnical documentation - General information and general index
- AS/NZS ISO 31000 Set:2013 Risk Management Set
- DEF(AUST) 5085B Engineering Drawing – Acquisition and Preparation for Defence Equipments Part 1 – Acquisition Requirements
- DEF(AUST) 5085B Engineering Drawing – Acquisition and Preparation for Defence Equipments Part 2 – Preparation Requirements
- FAA 8083-30 Chapter 2 Aircraft Drawings
- British Defence Standard 00-970 Design and Airworthiness Requirements for Service Aircraft
- US Military Specifications and Standards relevant to aircraft design
- ADF AAP7001.054 Airworthiness Design Requirements Manual
- FAR Part 23 Airworthiness Standards for Airplanes in the Normal, Utility, Aerobatic or Commuter Categories
- FAR Part 25 Airworthiness Standards for Airplanes in the Transport Category
- EASA CS-23 Certification Specifications for Aeroplanes in the Normal, Utility, Aerobatic or Commuter Categories
- EASA CS-25 Certification Specifications for Airplanes in the Transport Category
- CASA AC 21-99 Aircraft Wiring and Bonding
- FAA AC 43-13-1B Acceptable Methods, Techniques and Practices – Aircraft Inspection and Repair

Unit Mapping Information

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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 MEA701 Produce aeronautical engineering related graphics

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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:

- reviewing aeronautical engineering applications for required features, functions and context of aeronautical engineering graphics
- developing orthographic, isometric and other 3-D graphical representations and techniques for structure, mechanical, hydraulic, pneumatic, power plant, electrical and electronic system representation
- representing aeronautical components and systems using sketching and computer graphics with regard to the following:
 - structure and structural components
 - mechanical systems and components
 - hydraulic systems and components
 - pneumatic systems and components
 - fuel systems and components
 - power plants
 - standard fasteners and locking systems
 - electrical
 - electronic
- representing aeronautical components and features using a comprehensive range of standard conventions and graphical techniques
- representing a range of aeronautical systems using standard graphical representations for wiring, circuit and schematic diagrams
- engaging appropriate technical and professional assistance for advice as required
- reporting results of review and the application of graphics techniques and providing documentation, images and files according to job, regulatory and enterprise procedures.
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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:

- uses for graphics, such as:

- design specifications
- aircraft maintenance procedures
- modification orders and instructions
- technical specifications and descriptions
- physical arrangement of mechanical, hydraulic, pneumatic, power plant, and associated electrical and electronic systems and components
- diagrammatic layouts of electrical and electronic circuits
- aeronautical system schematic diagrams
- graphical representation techniques
- role of WHS and regulatory requirements, codes of practice, risk assessment and registration requirements relevant to aeronautical applications
- availability and features of standards related to aeronautical structure, power plants, systems and component, design, maintenance and modification
- typical criteria for aeronautical designs
- sketching techniques
- orthographic and 3-D representations
- hole basis, shaft basis and keyway tolerances and fits
- dimensioning conventions
- representing aeronautical components and systems using sketching and computer graphics
- standard conventions and graphical techniques as specified in standards, such as those listed in the Range of Conditions:
 - hole basis, shaft basis and keyway tolerances and fits
 - dimensioning, tolerancing for limits and fits
 - surface finish
 - weld symbols
 - webs, cross sections and cutting planes
 - chain drives, gear sets, pulley and belt drives
 - threads, fasteners and springs
 - shafts, keyways and splines
 - structural sections
 - surface finishes and welds
 - webs, cross sections, cutting planes
 - electric motors and electrically operated fluid power actuators
 - electrical, electronic, electro fluid (hydraulic and pneumatic) controls
- representations of aeronautical structure, systems and components, including:
 - structure and structural components
 - mechanical systems and components
 - hydraulic systems and components
 - pneumatic systems and components
 - fuel systems and components
 - power plants (engines and engine systems and components)

- standard fasteners and locking systems
- electrical
- electronic
- automatic flight and automatic engine control interface
- current and traditional methods of documentation generation and control:
 - computer library files compared to the use of reference charts and catalogue information
 - generation of orthogonal images from models
 - manual drawing
 - future developments in graphics and related engineering software
- worksite procedures and regulatory requirements for the processing and filing of graphics, specifications and operating and maintenance instructions/manuals, including CM and ILS requirements.
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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:
 - review features, functions and context of aeronautical engineering graphics
 - develop orthographic, isometric and other 3-D graphical representations and techniques for mechanical, fluid, electrical and electronic system representation
 - represent aeronautical components and assemblies using sketching and computer graphics
 - represent aeronautical components and features using a comprehensive range of standard conventions and graphical techniques
 - represent a range of aeronautical systems using standard graphical representations for wiring diagrams and system schematic diagrams
 - engage appropriate technical and professional assistance for advice as required
 - report results of review and the application of graphics techniques and provide documentation, images and files

- maintain accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge.
- 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).

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