



Australian Government

MEA703 Apply aeronautical modelling for computer-aided engineering

Release: 1

MEA703 Apply aeronautical modelling for computer-aided engineering

Modification History

Release 1 - New unit of competency

Application

This unit of competency applies to modelling of aeronautical systems and components for civil or military aircraft. It is suitable for people working as design drafters and those pursuing paraprofessional careers and qualifications in aeronautical engineering at the paraprofessional level.

This unit of competency covers the application of aeronautical modelling techniques for aircraft, aircraft structure, systems and component design, modification or maintenance purposes. It includes consideration of the computer-aided engineering (CAE) purposes for which the model is required, such as initial design, modification design or maintenance and as a basis for generating orthogonal drawings and wiring, circuit and schematic diagrams.

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

MEA701 Produce aeronautical engineering related graphics

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. Identify the fundamentals of aeronautical engineering modelling	1.1	Investigate applications for aeronautical modelling	
	1.2	Identify sustainability issues related to modelling	
	1.3	Identify work health and safety (WHS) and regulatory requirements related to modelling processes and materials	

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| | 1.4 | Identify the model parameters, form, function and features, virtual or physical |
| | 1.5 | Identify processes required which may include those for generating graphics, post-processing and physical modelling |
| | 1.6 | Identify technical and professional assistance for advice as required |
| 2. | Develop aeronautical model | |
| | 2.1 | Generate initial graphical model and adjust in consultation with stakeholders in accordance with procedures or agreement |
| | 2.2 | Prepare model for intended purpose |
| | 2.3 | Use model for purpose and complete investigative analysis or produce physical model |
| | 2.4 | Evaluate model against design criteria and with stakeholders and make adjustments as required |
| | 2.5 | Engage appropriate technical and professional assistance for advice as required |
| 3. | Finalise model | |
| | 3.1 | Report and demonstrate results |
| | 3.2 | Provide documentation, instructions, models and files as required |
| | 3.3 | Obtain sign-off |

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.

Models include:

- Virtual, such as computer generated solids models
- Physical models developed from the virtual model data

Model purpose includes:	• Software models • Aircraft design, including performance and power required • Component design (structural, mechanical, hydraulic and pneumatic) • System design and performance simulation (mechanical, hydraulic and pneumatic)
Features, functions and context of engineering mechanical modelling include:	• Techniques used for mechanical modelling • Sustainability implications of modelling • WHS and regulatory requirements related to modelling processes and materials • Model parameters, form, function and features, virtual or physical • Processes required which may include those for generating graphics, post-processing, and physical modelling • Required licensed technical and professional assistance
Post-processor	• A post-processor or code generator converts programmed instructions generated by computer-aided manufacture (CAM) software or computer-aided design (CAD) package into computer numerically controlled (CNC) program code to control a machine tool
Post-processing model for analysis or physical modelling includes:	• Setting up component, system and system software models • Processing dimensional data to create 2-D or 3-D code for CAM operations, such as printed circuit board manufacture
Rapid prototyping processes include:	• Selective laser sintering (SLS) which uses thermoplastics and metal powders • Fused deposition modelling (FDM) which uses thermoplastics and eutectic metals • Stereolithography (SL) which uses a photopolymer • Laminated paper manufacturing (LOM) which uses paper • Electron beam melting (EBM) which uses titanium alloys • 3-D printing (3DP) which uses a variety of materials
Criteria for aeronautical designs include:	• Safety and risk • Function • Aesthetics • Compliance with relevant regulations and standards • Manufacturability and maintainability • Marketability

Appropriate technical and professional assistance includes:

- Sustainability:
 - social, economic and environmental
 - material and energy resources
- Cost constraints
- Ergonomics, anthropometrics and physiology
- Facilities, plant and skills available
- Assistance from individuals with CASA maintenance certification licenses or those with supervisory authorisations in the 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 procedures include:

- WHS Acts and regulations
- Relevant standards
- Industry codes of practice
- Risk assessments
- Registration requirements
- Safe work practices
- State and territory regulatory requirements applying to electrical work
- 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
- 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

Modelling and related software includes:

- 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
- Lumped parameter model
- Empirical, random data tested model
- Finite element analysis (FEA) software
- Model based design

Unit Mapping Information

Release 1 – new unit based on and equivalent to MEM09153A Apply computer-aided modelling and data management techniques to aeronautical engineering designs

Links

Companion Volume implementation guides are found in VETNet -

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