

# SEMPEO2-08 - SQA Unit Code FP2A 04

## Carrying out aircraft detail fitting activities



### Overview

This standard covers a broad range of basic aircraft detail fitting competences that will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or that will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the detail fitting activities by obtaining all the necessary information, documentation, tools and equipment required, and to plan how you intend to carry out the required detail fitting activities and the sequence of operations you intend to use. You will be expected to select the appropriate equipment to use, based on the operations to be carried out and the accuracy required.

You will be expected to use a range of different materials, ensuring efficient use of them and, when applicable, to ensure that grain flow is taken into account. In carrying out the detail fitting activities, you will need to use a range of hand tools, portable power tools and simple machines to produce a variety of shapes and profiles.

During, and on completion of, the detail fitting operations, you will be expected to check the quality of the workpiece, using measuring equipment appropriate to the aspects being checked and tolerances to be achieved. You will need to be able to recognise fitting defects, to take appropriate action to remedy any faults that occur and to ensure that the finished workpiece is within the drawing requirements. On completion of the detail fitting activities, you will be expected to return all tools and equipment used to its correct location and to leave the work area in a safe and tidy condition.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the detail fitting activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the detail fitting activities, and to seek appropriate help and advice in determining and implementing a suitable solution. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate aircraft detail fitting techniques safely. You will understand the aircraft detail fitting process, and its application, and will know about the equipment, materials and consumables, to the required depth

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to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when using aircraft detail fitting techniques, and when using hand tools, power tools and machines. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

#### **Specific Standard Requirements**

In order to prove your ability to combine different aircraft detail fitting operations, at least one of the components produced must be of a significant nature, and must contain a minimum of **five** of the features listed in scope 8.

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#### Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
  - P2 plan the aircraft detail fitting activities before you start them
  - P3 obtain the appropriate tools and equipment for the aircraft detail fitting operations, and check that they are in a safe and usable condition
  - P4 mark out the components for the required operations, using appropriate tools and techniques
  - P5 cut and shape the materials to the required specification, using appropriate tools and techniques
  - P6 bend and form the materials, using the appropriate tools and equipment
  - P7 assemble and secure the components, using the correct fastening devices and joining techniques
  - P8 measure and check that all dimensional and geometrical aspects of the component are to the specification
  - P9 deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve
  - P10 leave the work area in a safe and tidy condition on completion of the fitting activities

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### Knowledge and understanding

*You need to know and understand:*

- K1 the health and safety requirements, and safe working practices and procedures required for the aircraft detail fitting activities undertaken
- K2 the importance of wearing appropriate protective clothing and equipment (PPE), and keeping the work area safe and tidy
- K3 the hazards associated with the aircraft detail fitting activities (such as use of power tools, trailing leads or hoses, damaged or badly maintained tools and equipment, use of forming and bending equipment, using hand shears and guillotines), and how they can be minimised
- K4 the procedure for obtaining the required drawings, job instructions and other related specifications
- K5 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken
- K6 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K7 how to identify the materials to be used; material identification systems; codes used and grain flow indicators
- K8 principles of marking out, and the equipment used in the aerospace industry
- K9 how to clean and prepare the surfaces to be marked out ensuring, where appropriate, that grain flow is taken into account
- K10 how to calculate bending allowances when marking out
- K11 how to select and establish suitable datums; the importance of ensuring that marking out is undertaken from the selected datums, and the possible effects of working from different datums
- K12 how to mark out the workpiece (including datums; cutting guidelines; square and rectangular profiles; circular and radial profiles; angles; holes which are linearly positioned, boxed and on pitch circles)
- K13 the various methods of pattern development that can be used (such as parallel line; radial line; triangulation), and typical applications of each method
- K14 ways of laying out the marking-out shapes or patterns to maximise use of materials
- K15 the need for clear and dimensional accuracy in marking out to specification and drawing requirements
- K16 the importance of using tools only for the purpose intended; the care that is required when using the equipment and tools; the proper way of storing tools and equipment between operations
- K17 the shaping methods and techniques that can be used to produce a range of shapes/profiles on the various section materials (such as

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- sawing, shearing, drilling, filing, abrading), and the sequence in which the operations will need to be carried out
- K18 how to select saw blades for different applications and materials, and methods of setting saw blades for cutting externally and internally (such as hand saws, mechanical saws, band saws)
  - K19 the various shearing methods that can be used (such as tin snips, bench shears, guillotines, cropping machines and nibbling machines)
  - K20 the range of hand tools and associated equipment that is used to produce a variety of shapes, bends, curved surfaces, dished profiles
  - K21 the range of bending and forming machines to be used (such as fly presses, bending machines, rolling machines, flanging machines)
  - K22 how to set up a bending machine to produce a range of forms (such as right-angled bends, angled bends, tray sections, channel sections)
  - K23 how to set up pinch/pyramid forming rolls to produce a variety of forms (such as curved profiles, cylinders, cones)
  - K24 how to produce flanges on curved/cylindrical components (using machines and hand tools)
  - K25 methods of drilling and finishing holes in sheet and stock materials (such as drills, reamers, countersinks, hole saws)
  - K26 the various types of files that are available; the cut of files for different applications; the importance of ensuring that file handles are safe and free from embedded foreign bodies
  - K27 the preparations and or treatments that may need to be carried out on the materials before and after the cutting and shaping operations
  - K28 the purpose and use of joint sealing agents and anti-electrolysis barriers, and the precautions to be taken when using them
  - K29 how to conduct any necessary checks to ensure the accuracy and quality of the components produced
  - K30 the problems that can occur with the cutting, shaping and forming operations, and how these can be overcome
  - K31 when to act on your own initiative and when to seek help and advice from others
  - K32 the importance of leaving the work area in a safe and clean condition on completion of the aircraft detail fitting activities (such as removing and storing power leads, isolating machines, removing and returning drills, cleaning the equipment and removing and disposing of waste)

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### Additional Information

#### Scope/range related to performance criteria

*You must be able to:*

1. Carry out **all** of the following during the aircraft detail fitting activities:
  - 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
  - 1.2 check that all measuring equipment is within calibration date
  - 1.3 ensure that all power tool cables, extension leads or air supply hoses are in a serviceable condition and PAT tested
  - 1.4 return all tools and equipment to the correct location on completion of the detail fitting activities
  
2. Mark out a range of material forms, to include **three** from:
  - 2.1 square/rectangular (such as bar stock, sheet material, machined components)
  - 2.2 circular/cylindrical (such as bar stock, tubes, turned components, flat discs, rolled cylinders/cones)
  - 2.3 sections (such as angle, channel, tee section, joists, extrusions)
  - 2.4 irregular shapes (such as castings, forgings, odd shaped components)
  - 2.5 detail assemblies
  
3. Use **two** types of material from:
  - 3.1 aluminium
  - 3.2 stainless steel
  - 3.3 titanium
  - 3.4 composite material
  - 3.5 other specific material
  
4. Use marking out methods and techniques which include the following:
  - 4.1 direct marking using instrumentsPlus **one** more from the following:
  - 4.2 use of templates
  - 4.3 tracing/transfer methods
  - 4.4 other specific method
  
5. Use a range of marking out equipment, to include **all** of the following:
  - 5.1 marking tools
  - 5.2 squares

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- 5.3 Vernier instruments
  - 5.4 rules/tapes
  - 5.5 protractors
  - 5.6 dividers/compass
6. Mark out workpieces, to include **all** of the following features:
- 6.1 datum/centre lines
  - 6.2 circles and radial profiles
  - 6.3 square/rectangular profiles
  - 6.4 linear hole positions
- Plus **two** more from the following:
- 6.5 angles/angular profiles
  - 6.6 allowances for bending
  - 6.7 radial hole positions
  - 6.8 simple pattern development
7. Cut and shape the materials, using **four** of the following:
- 7.1 saws (hand or mechanical)
  - 7.2 tin snips
  - 7.3 cropping machines
  - 7.4 guillotines
  - 7.5 drills and hole saws
  - 7.6 files
  - 7.7 bench knives
  - 7.8 nibblers
  - 7.9 abrasive discs
8. Produce components which combine different operations and have features that cover **all** of the following:
- 8.1 edges/faces that are square to each other
  - 8.2 curved or circular forms
  - 8.3 edges/faces that are parallel
  - 8.4 holes linearly pitched
- Plus **two** more of the following:
- 8.5 edges/faces that are angled
  - 8.6 external profiles
  - 8.7 internal profiles
  - 8.8 holes radially pitched
9. Bend and form materials using **four** of the following:
- 9.1 bench folding machines
  - 9.2 hand tools
  - 9.3 box pan folding machines
  - 9.4 heating techniques
  - 9.5 pinch or pyramid rolling machines
  - 9.6 shrinking techniques

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- 9.7 presses
- 9.8 stretching techniques
  
- 10. Produce a range of components with features that cover **five** of the following:
  - 10.1 right angled bends
  - 10.2 curved profile
  - 10.3 angled bends
  - 10.4 cylindrical shape
  - 10.5 square flanges
  - 10.6 conical shape
  - 10.7 tray sections and channels
  - 10.8 dished profile
  - 10.9 curved/circular flanges
  
- 11. Use **both** of the following types of measuring equipment during the detail fitting and checking activities:
  - 11.1 external micrometers
  - 11.2 Vernier calliperPlus **four** more of the following:
  - 11.3 rules
  - 11.4 feeler gauges
  - 11.5 squares
  - 11.6 bore/hole gauges
  - 11.7 callipers (external and internal)
  - 11.8 radius/profile gauges
  - 11.9 Vernier protractors
  - 11.10 thread gauges
  - 11.11 depth micrometers
  - 11.12 dial test indicators (DTI)
  - 11.13 depth Verniers
  - 11.14 surface finish equipment (such as comparison plates, machines)
  - 11.15 slip gauges
  - 11.16 coordinate measuring machine (CMM)
  
- 12. Produce components to **all** of the following standards, as applicable to the process:
  - 12.1 components to be free from false tool cuts, burrs and sharp edges
  - 12.2 finished components meet the required shape/geometry (to the template profile)
  - 12.3 completed components are free from excessive tooling marks, deformation or cracking
  - 12.4 dimensional tolerance +/- 0.25mm or +/- 0.010"
  - 12.5 flatness and squareness 0.05mm per 25mm or 0.002" per inch
  - 12.6 angles within +/- 0.5 degree
  - 12.7 screw threads to BS Medium fit



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12.8 reamed and bored holes within H8

12.9 surface finish 63  $\mu\text{in}$  or 1.6  $\mu\text{m}$

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<b>Developed by</b>	SEMTA
<b>Version number</b>	2
<b>Date approved</b>	December 2011
<b>Indicative review date</b>	December 2016
<b>Validity</b>	Current
<b>Status</b>	Original
<b>Originating organisation</b>	SEMTA
<b>Original URN</b>	08
<b>Relevant occupations</b>	Engineering and manufacturing technologies; Engineering;
<b>Suite</b>	Performing Engineering Operations Suite 2
<b>Key words</b>	engineering, engineering operations, aircraft detail fitting, manufacturing, tools, equipment, materials, quality, tolerances, grain flow