

Technical Handbook

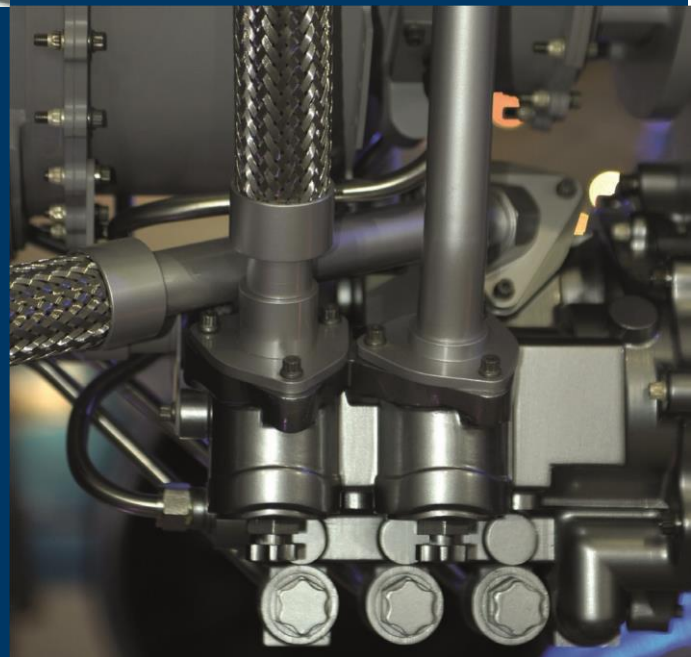
Aeronautical Engineering: Mechanical



About WorldSkills UK

WorldSkills UK is a set of dynamic skills competitions for young people and adults, designed and delivered by industry experts annually in over 70 skills.

Many WorldSkills UK competitions lead into WorldSkills International competitions which are biennial global events.



For further details, please visit:
www.worldskillsuk.org/worldskills-uk-competitions

For further information and details of our services please contact

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Aeronautical Engineering: Mechanical

Introduction

The aim of this manual is to help competitors prepare for the Aeronautical Engineering: Mechanical competition at regional and national level. We hope this will help competitors to perform to the best of their ability during the competitions. The guide contains general advice, technical tips and a more in-depth overview of the competition structure and its content.

Using the tips and advice throughout the guide will help you focus on the competition areas with a higher level of accuracy. Read the instructions, look at and review tasks thoroughly before beginning. Teach yourself to step back occasionally to see if you are achieving your goal.

Remember it's not a race; you are competing against a standard, a very high standard, but one that is achievable.

Competition Overview

This competition has been designed to reflect the role of a Mechanical Technician and the standards that are expected within the aeronautical industry.

Competitors will have to demonstrate the following skills:

- aircraft knowledge
- daily inspection (pre-flight check)
- design, build and test a hydraulic circuit
- engine boroscope
- flying control rigging
- sheet metal hand skills
- powered flying control removal/refit and rigging.



Stage 1 Registration and preparation

To compete in the competition, you must register using the WorldSkills UK website. You will then receive a confirmation of whether you have successfully registered. Whilst you wait to get to the next stage of the competition, you should do your best to prepare for the competition by taking a look at the **pre-competition activity task** made freely available to you on [our website](#).

Stage 2 Passive stage

Shortly after registering, the competition journey will begin with what is called a passive stage. This will be an online task that the competitor will complete and then return to WorldSkills UK for marking. This is a really important part of the competition journey as it gives the competitor an early taste of what knowledge is needed to be successful on the journey. Once everyone's scores have been totalled, competitors will be informed if they have passed on to the next round, called the national qualifiers.

Stage 3 National Qualifiers

For competitors who have managed to pass through the passive stage the next step is the national qualifiers. This is where the competitor will be allocated a physical local centre from where to compete and will give competitors the chance to demonstrate their skillset. This stage will be marked by WorldSkills UK expert judges. The top eight scores from the national qualifiers will then go through to the next round, the national finals.

Stage 4 WorldSkills UK National Finals

The top eight (8) competitors in the UK will be invited to compete in the UK National Final which is the pinnacle of the UK national competition cycle.

The finals are usually a large scale event, and a chance to show off your skills, meet a bunch of industry professionals and other competitors taking part, as well as bring your family along to see you compete.

Stage 5 WorldSkills UK International Competitions

Please note the 2021 competition will not be a selection year for the international competitions.

Beyond the national finals, there are a host of opportunities for competitors. Age-eligible competitors who show the highest skills, passion, and drive from the national finals will be given the opportunity to compete to train for the EuroSkills and WorldSkills international competitions.

Those who are not eligible for international competitions may join the Champions programme, which allows continued involvement, including the opportunity to work with WorldSkills UK and visit schools, colleges, and events to inspire the next generations.

Alternatively, if training is of interest to you, you could consider supporting WorldSkills UK with organising and training, and even helping to run the National Finals.

Core Competencies

The following table lists the competitions core competencies and the expected standards within these from the stages of WorldSkills UK (WSUK) national qualifiers through to the UK National Final and where applicable into the WorldSkills International (WSI) competition. Please note that the 2021 national competition is not a selection year for international competitions and so a competitor's journey will end at the national finals.

| Core competencies and standards for WorldSkills UK Skills Competitions activities | | Qualifiers/ Passive stages | National Final | WSI Team UK |
|---|---|----------------------------------|-----------------------|-----------------------|
| Competency | Perform a simple sheet metal repair scheme | | | |
| Standards | Competitors shall know and understand: <ul style="list-style-type: none"> • how to interpret drawings Competitors shall be able to: <ul style="list-style-type: none"> • bend sheet metal with a high degree of accuracy • layout fastener and install solid rivets in accordance with the supplied drawings • form a hat section and channel and fit as required to make the assembly • to make the assembly shown in the drawing in accordance with Standard Practices (AC 43 – 13). | Y N Y N Y | Y N Y N Y | Y Y Y Y Y |
| Competency | Rig a Flight Control | | | |
| Standards | Competitors shall know and understand: <ul style="list-style-type: none"> • how to interpret drawings Competitors shall be able to: <ul style="list-style-type: none"> • correctly set flight control cable tension with the flying controls centred (using a rigging pin) • correctly and safely set all flight control travels limits. | N N N | Y Y Y | Y Y Y |
| Competency | Perform Aircraft Daily Inspection | | | |
| Standards | Competitors shall be able to: <ul style="list-style-type: none"> • perform a Daily Inspection (D.I.) on an aircraft to determine whether or not the aircraft is safe for flight or if further inspection is required as per the defect report and daily inspection checklist. Competitors shall be able to: <ul style="list-style-type: none"> • complete corresponding paperwork to reflect the status of the completed D.I. | N N | Y Y | Y Y |
| Competency | Removal and installation of an Aircraft component | | | |
| Standards | Competitors shall be able to: <ul style="list-style-type: none"> • able to remove and install an aircraft component. | Y | Y | Y |
| Competency | Blending a compressor blade | | | |
| Standards | Competitors shall be able to: <ul style="list-style-type: none"> • blend out damage incurred on an aircraft gas turbine compressor blade. • carry out work in accordance with the appropriate manufacturer's maintenance manual. | N N | N N | Y Y |
| Competency | Gas Turbine Boroscope Inspection | | | |
| Standards | Competitors shall be able to: <ul style="list-style-type: none"> • use a boroscope to inspect and report defects found inside a gas turbine engine without removing any components from the engine. | N | Y | Y |
| Competency | Hydraulic system design/build (stepping stone to electrical wiring and trouble shooting) | | | |
| | | N N | Y Y | N N |

| | | | | |
|--|---|---|---------------------------|------------------------|
| Standards | Competitors shall know and understand: <ul style="list-style-type: none"> • how to design/develop hydraulic circuit • how to draw circuit diagram, using correct symbols • built / functionally test design • trouble shoot any development issues • prove working design. | N | Y | N |
| | | N | Y | N |
| | | N | Y | N |
| Core competencies and standards for WorldSkills UK Skills Competitions activities | | Qualifiers/ Passive stages | National Final | WSI Team UK |
| Competency | Electrical wiring troubleshooting | | | |
| Standards | Competitors shall know and understand: <ul style="list-style-type: none"> • The use of the Standard Wiring Practices Manual Competitors shall be able to: • fabricate, install and terminate wire loom as per wiring diagram • troubleshoot faults in a wiring harness and correct attachment. | N | N | Y |
| | | N | N | Y |
| | | N | N | Y |
| Competency | General | | | |
| Standards | Competitors shall know and understand: <ul style="list-style-type: none"> • the correct use of reference manuals i.e. AC 43 – 13 Aircraft Standards Manual • following procedure as per instructions in Aircraft Maintenance Manuals. | Y | Y | Y |
| | | Y | Y | Y |

General Instructions

1. Maximum working time is 3 x 1 hour tasks at the national qualifiers and 6 tasks of differing lengths over 11 hours (3 Days) at the National Final.
2. At the start of the competition an allotted time will be allocated for work planning. This time is not part of the working time.
3. The competition will consist of 6 tasks/module(s).
4. All supplied equipment and materials must be accurately checked by the competitor upon commencing the competition.
5. All materials and equipment must be marked out/used in the most economical method.
6. Competitors will lose marks for any misplaced, lost or spoiled materials and/or equipment, where this is the result of competitor error.
7. Minimum marks will not be awarded for dimensional accuracy or technical perfection where instructions have been disobeyed
8. Competitors will lose marks for each minor breach of the Health & Safety rules. Where a competitor puts themselves or any other person at risk as a result of a Health & Safety breach, the task will be stopped. Where a task is stopped due to a Health & Safety risk, the judge will decide if the task can be continued safely.

Practice & Preparation

- prepare using the online tools, such as the pre-competition activity available at the [WorldSkills UK website](#)
- where possible practice the tasks you don't use in your everyday work or course.
- speak to your employer or lecturer to ask for help with learning or equipment where needed.

Remember, this is your competition journey, make time to prepare for your competition, ask for the support and guidance you need and be the best you can be.



Specification & Drawings

Drawings, diagrams and aircraft specifications will be given at the live competition.

A wise man can learn more from a foolish question than a fool can

learn from a wise answer.

Bruce Lee

Judges Top Tips

The following eight aspects are neither exhaustive nor prescriptive and not a 'magic' formula to success. However, these are tips based on being involved with competitions for many years and we hope these will help you in future competition participation.

1. **Pressure.** You will be nervous but you will need to keep nerves under control and not let the pressure overtake you. But managed pressure can be good, increasing energy and performance potential.

How to handle nerves;

- a. **Listen to the Judge's brief and ask questions** – what sort of questions depends on you, i.e. repeating an aspect of their brief; gives you a chance to understand more.
 - b. **Importantly, understand at what point your allotted time actually starts**, i.e. normally after the Judge's brief.
 - c. **Read your competitors' brief**; everything you need to know for the task is in that brief. Allow yourself 2 to 3 minutes to read it. Read it at least twice as your first reading will be too fast.
 - d. **Take a deep breath and start the task.** You are against the clock and so you will need to work with focus.
 - e. **Task going wrong? Take a moment, think.** If necessary, quickly re-read that part of the instructions and then refocus. You may need to move on from that particular aspect of the task.
2. **Time Management.** The tasks are all against the clock. So, once you have had your task brief and know how long you have, then quickly plan your workload. Section the aspects of the task into time blocks.
 3. **Remember**, it is a competition and so practically everything you do within the task is marked and worth points; so focus on gathering points. Leave some time to put tools away at the end (that is worth points), clean up the working area (again, worth points). If you are stuck on a particular aspect then accept you may or may not get points for that particular part and in order to move onto the next part of the task, ask the Judge for assistance. Remember, there are other points to be earned.
 4. **Think outside of the task.** Where are the Risk Assessments? If using any POL, where is the COSHH? If in doubt, then ask the Judge where these items are. Remember, you have a limited time to display your technical skill to the Judge and so you must be smart with your actions and work levels.
 5. **Practice before the competition** at working under pressure and with someone watching you; perhaps your works' supervisor or college lecturer. Get them to be super critical on your work quality, methods of work and approach.
 6. **Understand the advantage of selecting the right tool for the job.**

7. **Sleep.** Get plenty of sleep the night before. If offered, take advantage of accommodation for the night before the competition. Resist the temptation to consume alcohol the night before and have a good breakfast on the day of the competition; these actions will assist in preparing your mind and body.
8. **Arithmetic.** Practice mental arithmetic. It will sharpen your mind. Perhaps try Sudoku; aim to achieve at least medium level (start at mild or easy). Do mental arithmetic whenever the opportunity arises, e.g. just filled your car or motorbike, how many litres did you put in the tank. Mentally (without the aid of calculator convert Litres to Imperial Gallons - divide Litres by 4.5 to give Imperial Gallons or multiply Litres by 0.22). Understand the relationship between imperial and metric. Remember some datums. e.g. 25.4mm to 1 inch and so, 12.7mm is ½ inch and 6.35mm is ¼ inch.
1 Imperial Gallon is 4.5 Litres (to 1 decimal place - it is actually 1 Imperial Gallon = 4.5461 Litres).

Technical Guidance

Technical guidance for each specific task and / or tooling will be given at the competition.

Task Breakdown

The following is an example of the marking criteria for the National Final:

| Criteria | Task | Mark |
|--------------------|------------------------------|-------------|
| A | Hydraulic Design & Build | 15% |
| B | Mechanical Rigging & Control | 20% |
| C | Engine Boroscope | 20% |
| D | Sheet Metal | 25% |
| E | PFCU removal | 10% |
| F | Daily Inspection | 10% |
| Total Marks | | 100% |



Health & Safety

During the competition as in any work or educational facility you have a duty to protect yourself and those around you.

As an Organising Partner our delivery partners have a responsibility to protect you and keep you informed about health & safety procedures and practices including: • Making the competition area safe and without risks to health

- ensure plant and machinery are safe and that safe systems of work are set and followed
- ensure hazardous articles and substances are moved, stored and used safely
- provide adequate welfare facilities
- give instruction, information, supervision and where applicable training necessary to maintain health and safety.

As a competitor you have a legal duty to:

- take reasonable care for your own health & safety and that of others who may be affected by what you do or do not do
- cooperate with the Organising Partner and/or their appointed delivery team on health and safety matters
- correctly use work/competition items provided, including personal protective equipment, in accordance with instructions and/or training given
- not interfere with or misuse anything provided for your health, safety or welfare.

In particular:

- all health and safety regulations, including protection standards, specified by the competition hosts and delivery team, must be followed exactly. Any defect in machines or equipment must be reported immediately
- safety goggles must be used in all material-removing operations
- shoes and clothing must comply with health and safety regulations.

Conclusion

Remember, the competition will be difficult but achievable. There will be a lot of 'self-pressure'. You need to learn how to control this and focus on the task in hand.

Once a task is complete, you cannot change the outcome good or bad, start the next task afresh and with positivity.

Drink plenty of water throughout the competition, staying hydrated will help with your concentration, focus and will reduce stress and headaches.



We wish you the best of luck in your competition journey,
and would like to leave you with the following quote:



Life is a series of experiences, each one of which makes us bigger, even though sometimes it is hard to realise this. For the world was built to develop character, and we must learn that the setbacks and grieves which we endure help us in our marching onward.

Henry Ford

Further sources of information and websites

WorldSkills UK

Email: enquiries@worldskillsuk.org Web: www.worldskillsuk.org Tel: 0800 612 0742