GET READY FOR THE REGIONAL: HOW DO I WIN WITH CAD?

Institution of MECHANICAL ENGINEERS

Wednesday 11th March 2026

13:00-14:00 GMT

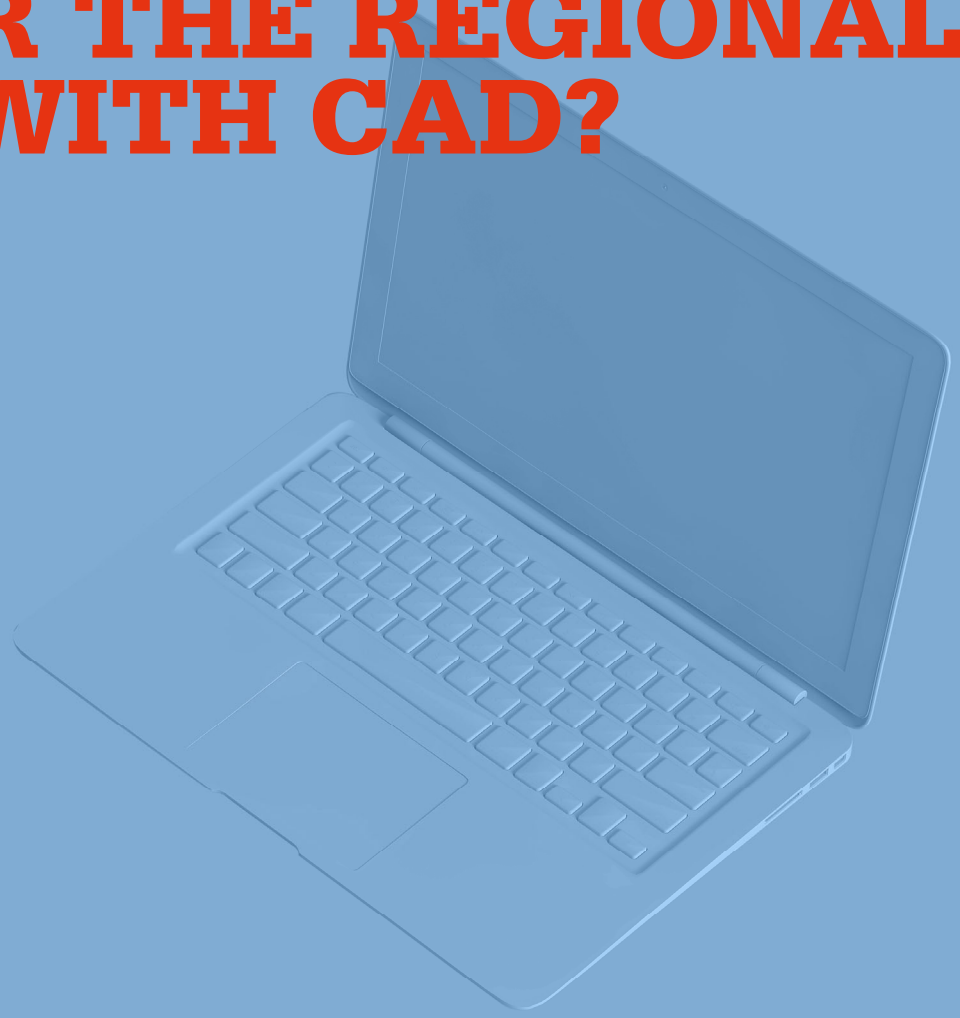
Eur Ing Davide Migliorini D Migliorini Ceng FIMechE

Design Challenge Chairman

Captain Matt Lister RN BEng MSc PGDip psc(j) MA CMarEng FIMarEST

Design Challenge Head Judge

Evolito
The Power of Electric Flight



Improving the world through engineering

GREAT! YOU HAVE WON YOUR INTERNAL SELECTION SO… WHAT'S NEXT?

Well done, you have won your internal selection! So how do you win your regional final?

Now the competition is getting exciting: you will face other teams from other universities or UTCs, that may have designed a different device, however you know you did it right! But…

- How will you be scored?

IMechE Design Challenge - General Specifications 2026 – Sections 1.1.7, 1.4, 7, 9, 11, 14 and 15 for penalties. The competition scores are detailed in IMechE Design Challenge - Project Specifications and rules 2026 – Sections 5.10 to 5.18, 6.12 to 6.22 and 7.7 to 7.13 for penalties

- When should we register and submit our files?

IMechE Design Challenge - General Specifications 2026 - Section 1.11 and 1.2

KEY ELEMENTS IN THE REGULATIONS

- What is really important in the regulations?

The General Specification and the Project Specification and Rules should take approximately 45 minutes for a comprehensive reading. Everything should be considered and understood.

Safety, by design and by execution, is taken very seriously: please ensure the guidelines are followed!

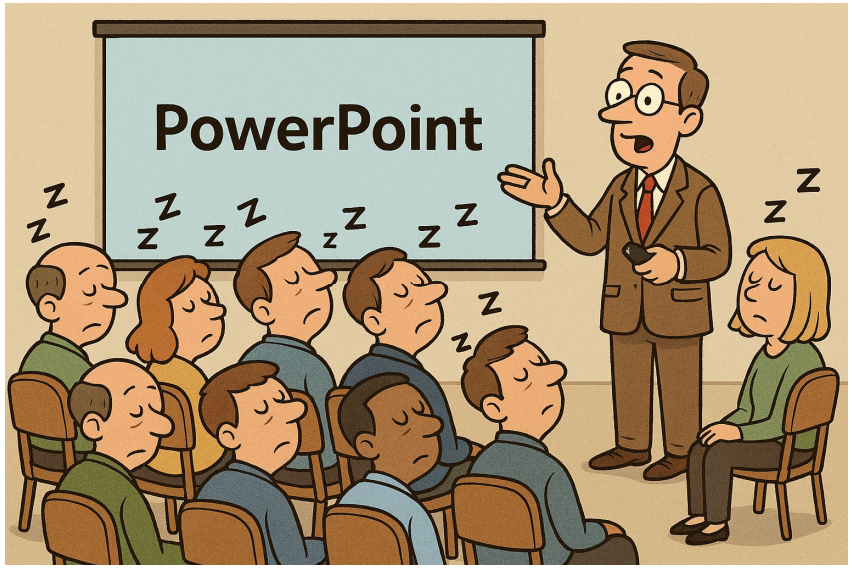
The students should deliver the elements of the competition (see IMechE Design Challenge - General Specifications 2026 - sections 1.4 and 1.5) in a complete and reviewed way. This shows understanding of the requirements and appreciation for the work of all the volunteers that will review and score the team.

NERVOUS ABOUT PRESENTING? BRUSH UP YOUR SKILLS

Are you presenting the activities in a way that everyone can understand? Are the Computer Aided Design (CAD), Bill of Materials (BoM), Poster and Video presentation clear?

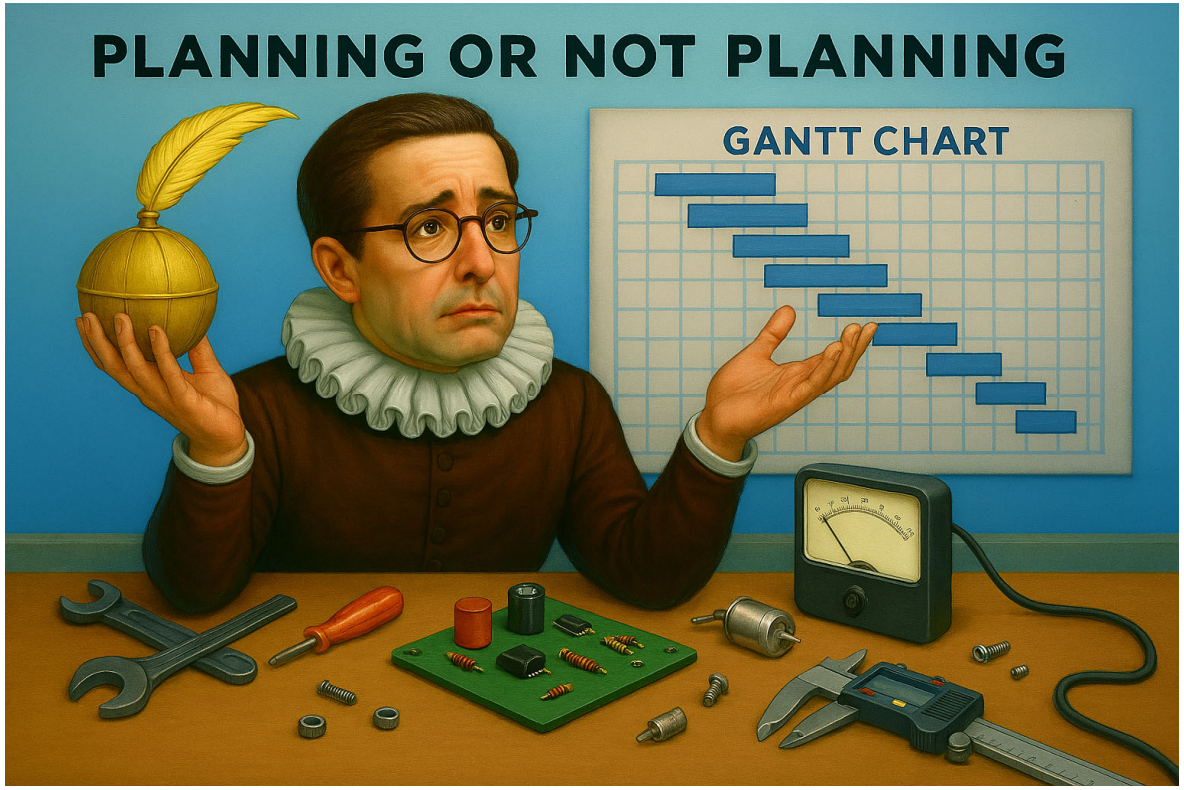
A few suggestions:

- Video your presentation and review it, this helps the presenter(s) see themselves and, if needed, develop their/your skills in becoming better. After watching as normal user, did you understand what the presentation is about? Would you buy that product?
- Why not try the “grandma” test?!?! Before submitting a poster or a presentation, ask someone of a different background to review it, better if they don’t know about your project. If they can understand the content and ask questions about it, then your presentation and posters are great!
- Practice, practice and practice again! The video recording and other peer reviews should help you to become clear and confident in the delivery. Only time gives you results.



PLANNING OR NOT PLANNING, THAT IS THE QUESTION…

This is the Design Challenge, aiming to help consolidate and develop further design capabilities for engineering students. However… some planning and project management skills are needed.



How do I organise my project phases?

- Time management: don't overkill by too much planning, balance between planning and execution. Remember: you will be scored on what you have delivered and its execution, not on a Gantt chart!
- Plan for success but allow for contingencies. How much of my time should and could I spare for things that will go wrong, without panicking right the night before – and risk getting penalties for late submission?

MEET DEADLINES AND MORE QUICK WINS FOR YOUR TEAM

- ❑ Do not miss the deadlines and read the regulations: the files submitted are the ones that will be judged!
- ❑ Make sure you cover the basics in each section! If you do not have a complete and valid submission, your team will not be cumulate points as overall winner – and will not get to the finals.
- ❑ Which penalties will affect your score but will still allow the team to participate in the overall ranking? Balance: an incomplete submission on time may be better than a late submission and, clearly, is better than no submission!
- ❑ Read the regulations: look for the easy wins and don't miss out on those! In each section there are some points for an "easy grab" and others that have a "heavier weight"… why not target those big ones first? The easy ones may come for free – as consequence of the bulk of the job.

Getting full and complete submission on time is already a win: take some time to praise yourselves!

WHEN AND WHERE SHOULD I BUILD? WHAT SHOULD I TEST?

(Applicable to Foundation and Advanced categories only)

The physical build is a fundamental stage and as it is usually the final stage. However, sometimes it could be too late to rectify problems.

We suggest that you design on a priority risk basis and ask yourself the following questions:

a) Can I simulate virtually, with basic principle calculations or with CAD plans to achieve a better understanding?

b) Am I taking too long in designing or understanding the problem in the virtual world instead of making a prototype / test / practical activity?

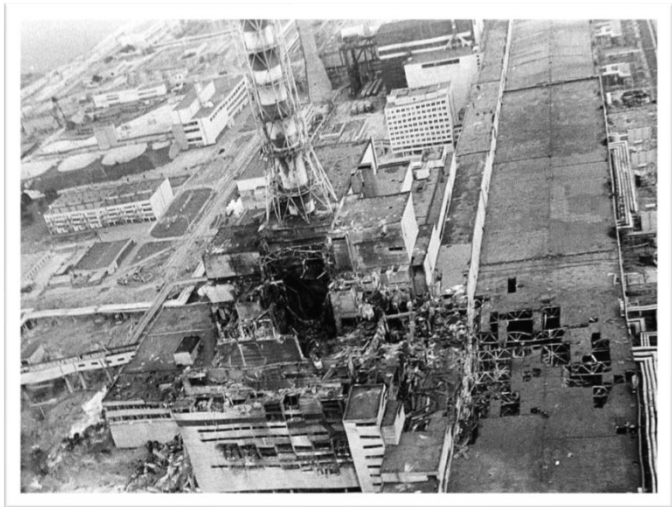
Complete the build and test development cycle to de-risk solutions, implement the fixes and improvements that were planned, close the development stages documenting. Use testing to identify weaknesses in terms of durability or robustness.

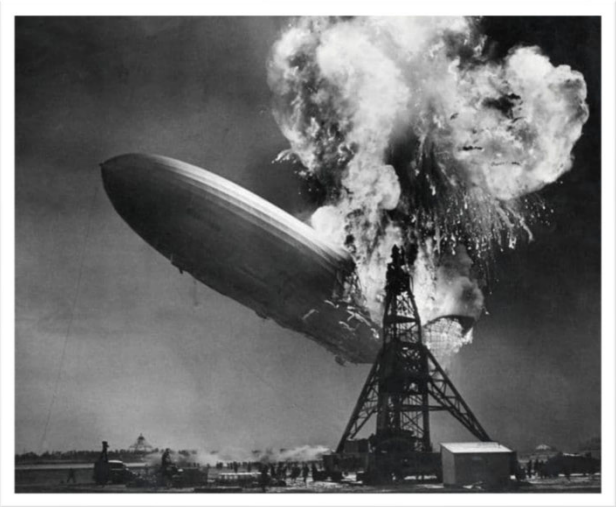
If you have time and budget left, think about improvements via another design – build – test loop.

INTRODUCING OUR HEAD JUDGE

Captain Matt Lister RN
BEng MSc PGDip psc(j) MA CMarEng FIMarEST
Design Challenge Head Judge

ENGINEERING RULES ARE IMPORTANT…





REGULATIONS ARE IMPORTANT IN DESIGN…!

Full Details in the Design Challenge Specification (Section 6, 8, 10, 12 & 14)

Specification Rules – Volume, materials, 3D Model,

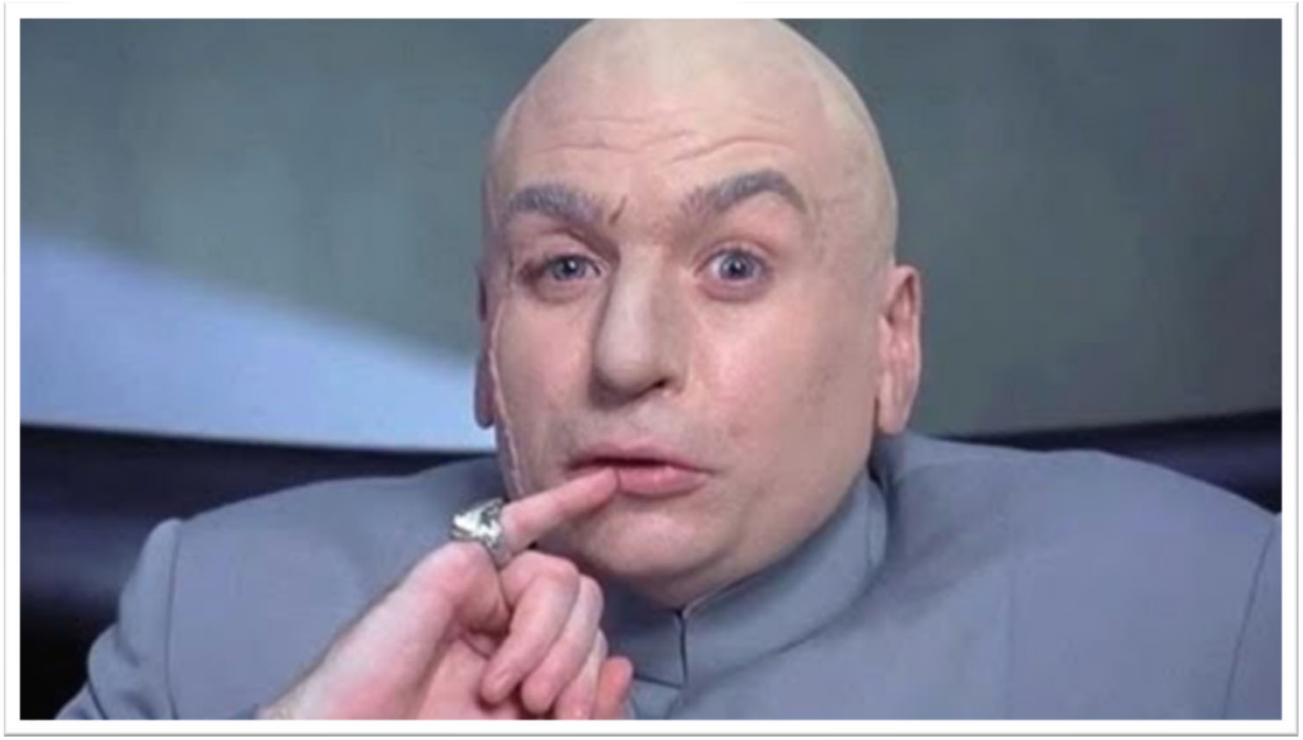
Operation Rules – autonomy, control, recharging,

Admin Rules – risk assessment, BOM, audits, poster size, branding

QSHE – fittings, fixtures, PPE

REGULATIONS ARE IMPORTANT IN DESIGN…!

“Rule 4.31 – No explosive charges or fluid combustion systems can be used”



SCORING CRITERIA

Full Details in the Design Challenge General Specification (Sections 1.4, 7, 9, 11 & 13) and Project Specification (Sections 5 and 6)

- Design – 10/100
- Poster – 10/100
- Presentation – 10/100
- Peer Review (Regional Only) – 10/100
- Design Excellence (National Only) – 10/100
- Challenge – 60/100

* Teams must have a valid score in all sections for a chance to win.

HOW 3D CAD HELPS?

Most 3D CAD platform share the same positive outcomes

1) Ease of use
2) High-Quality Design Aesthetical Visualization for Demonstration
3) Compatibility with Global Standards
4) Effortless Documentation – manages the BoM for us
5) Manufactureign review and production - straight to laser cut or 3D print
6) Digital Backup – if anything goes wrong, I still have a full virtual copy
7) Redrawing - design changes - design iterations
8) Help controlling product VS allowed envelope

NOT A CAD USER… WHERE COULD I START?

A lot of free CAD software are nowadays high quality, here some examples of software and commercial parts repositories. Most software embed a solid engineering base to guide new starters though good modelling and design practices.

- Autodesk Fusion
- Freecad
- Onshape
- 3dcontentcentral
- traceparts
- grabcad

And… Yotube! – for any question, how to use, to check out other's work, start a new project

Note: the Design Challenge has no commercial obligation or relation with the companies mentioned in this document.

COMPETITION BOUNDARIES

You are now enrolled, well done! How can you now design a product to try to compete and win? Let's try to start form the first principles and look into the regulations. What are the boundary conditions?

- The rig cannot be altered, touched or modified by the competing team once it has been setup for the event (IMechE Design Challenge - Project Specifications and rules 2026 – Section 2)
- The maximum point for a run is 30, with time rounded up to the nearest 5 seconds (IMechE Design Challenge - Project Specifications and rules 2026 – Sections 5.10, 5.11, 6.12, 6.13)
- The device should contact the top barrier, produce red light and sound via a buzzer and remain in contact up to 15s (IMechE Design Challenge - Project Specifications and rules 2026 - Sections 5.4 and 6.4)
- The longest distance for the mission is 3.6m [1.8m + return] for the Concept and Foundation categories (IMechE Design Challenge - Project Specifications and rules 2025 – Figure 7 and Sections 5.1 to 5.8) and 4.5m [1.8m + return + further ascent up to the mid target] for the Advanced category (IMechE Design Challenge - Project Specifications and rules 2025 – Figure 7 and Sections 6.1 to 6.10).

CAD AND BOM MANAGEMENT TRICKS

- If you don't change the order of the elements in the CAD assembly tree, each time you export the BoM the new elements will be added only at the bottom. This helps in managing the extra content in the excel table, for the BoM submission to the design challenge.
- Add as early as possible industrial fixings, bearings, supports and any detail reasonably practicable; check between datasheet and CAD mass if there is a good alignment. This will be a double win: automatically help you iterate the performance calculations and get a better score for CAD vs BOM representativeness.
- As much as possible, try to integrate any cable management and electrical protection - enclosure or transmission protection as part of the design of the components. This will save time, mass and cost. Holes in the chassis can work as wiring pass-through; extending a flange where the motor and gearbox is mounted could protect electrical junctions, … try to merge creativity with practicality!
- Changing motor and gearbox size (if the gearbox is integrated – bought in) within the same family has relatively little impact on mass and therefore vehicle performance. Leave this change once the CAD is more mature and detailed. With this proposed order of operations, you have a better estimate of mass and your first principle calculations will become more accurate faster.

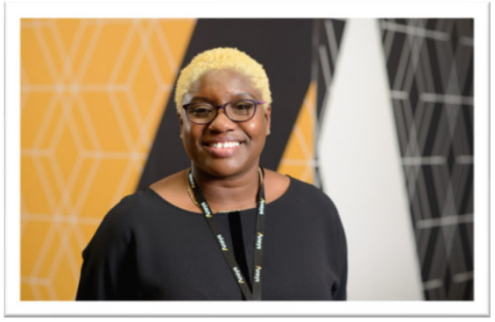
IMECHE DESIGN CHALLENGE STEERING COMMITTEE

Davide Migliorini
Chair

Matt Lister
Head Judge

David Ball
Founder

Dave Terry
RSB Member



Bridget Ogwezi
Industry Liaison, Ansys

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Event Operations Project Lead

Forward questions to: designchallenge@imeche.org

UPCOMING EVENTS

- Let's move from the regional winners to the national winners! - Thursday 11th June 2026
- Get Ready for the Design Challenge National Finals – Wednesday 2nd September 2026

- Design Challenge National Finals - 1 Birdcage Walk, London SW1H 9JJ – Friday 9th October

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QUESTION TIME

THANK YOU.

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THE DESIGN CHALLENGE IS A COMPETITION TO ENJOY!