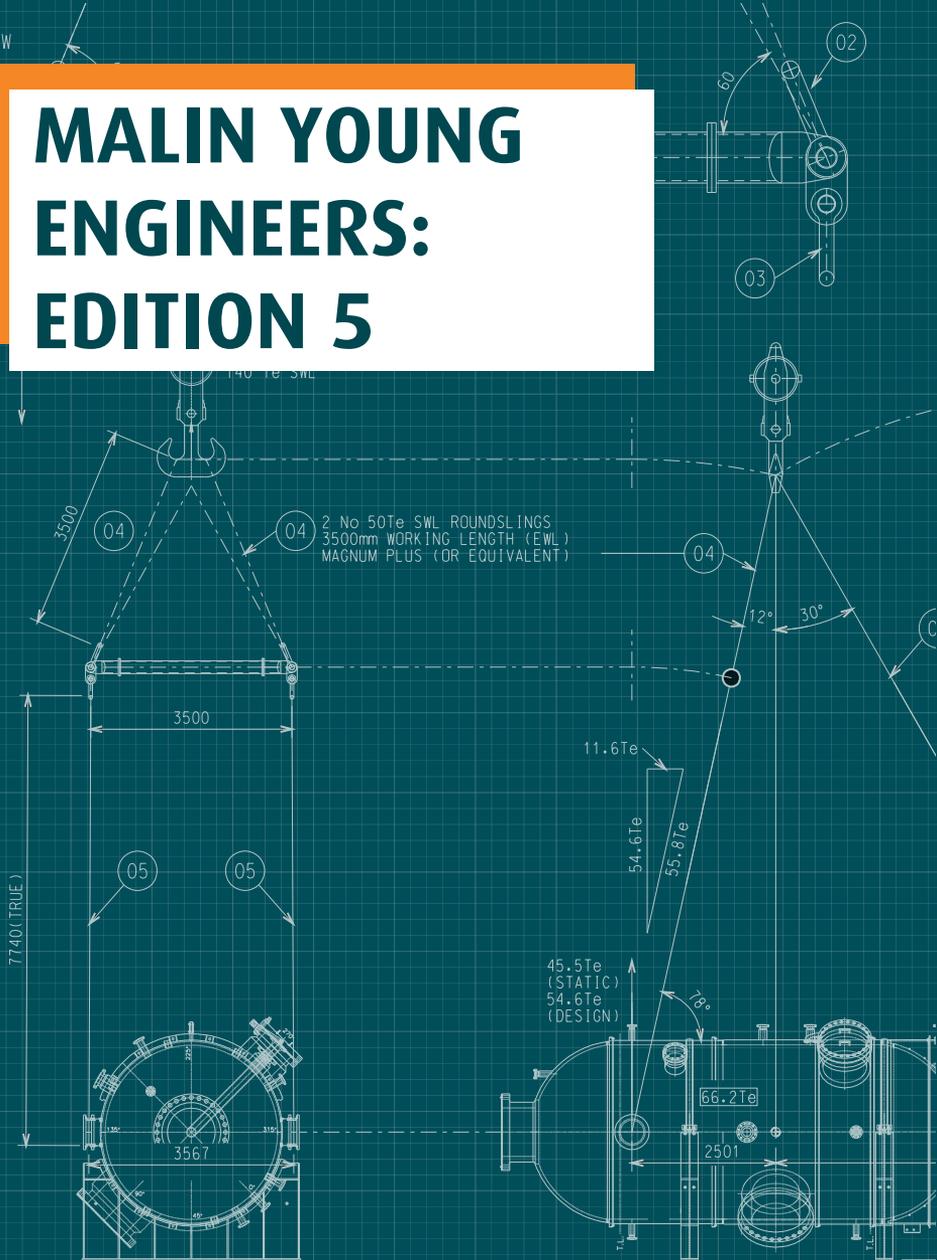


# MALIN YOUNG ENGINEERS: EDITION 5





# CONTENTS

- 4 Introducing Malin young engineers
- 6 Challenge one
- 8 Challenge two
- 10 Challenge three
- 12 Challenge four
- 15 Your notes

OUR TEAM WORK ON A VARIETY OF PROJECTS, ACROSS A RANGE OF SECTORS, ALL OVER THE WORLD

# INTRODUCING MALIN YOUNG ENGINEERS

The Malin Group consists of a varied mix of talented individuals, who span a number of specialisms, from naval architects, design draughtsmen, structural engineers and project managers, to lifting engineers, heavy haulage experts and marine operations personnel. All have a passion for problem solving and are very creative - and all took a real interest in science, technology, engineering and maths (STEM) at school.

Our team work on designing, building, launching and maintaining ships, as well as calculating how best to move materials from A to B - that may be using a trailer, or maybe a crane. They also test the strength of structures and get involved in 3D modelling. They work on projects all over the world, and work for people such as Rolls Royce, FH Bertling, BP, BAE Systems - even the Ministry of Defence.

We are committed to supporting the next generation of engineers, so have come up with a range of challenges for you - a Malin young engineer - to complete. We hope you enjoy them, and who knows, we may be offering you a job in a few years time!

# CHALLENGE ONE: BILL OF MATERIALS

## HOW TO CREATE A BILL OF MATERIALS

For this challenge you are going to learn about bills of materials or BOMs for short.

If you are involved in an engineering project, you will likely have to read a BOM. A BOM is essentially a list of all the materials in that product or system, a bit like a list of ingredients for your favourite dish. So, if we consider a bike, its BOM would include wheels, frame, brakes, handlebars, gears etc.

## BILL OF MATERIALS (BOMS)

So why are BOMs so important? There are several reasons:

- They make a clear guide or checklist of all the components in a product – which helps when creating or designing the piece.
- They create almost a shopping list of items so you can more effectively plan your project
- They enable us to effectively cost a product as we can find out individual costs for all the components – plus we can consider the most sustainable option for each part.

## THE CHALLENGE

Find and dismantle a simple household product: please note before you do so however, to get permission from a parent or carer. We would recommend something that can be easily taken apart with a screwdriver. A remote control is a good example.

Take detailed notes as you take each step in dismantling the object; diagrams could also be useful here. This is so you can follow it in reverse order when you move to put the item back together again.

Once dismantled to a sensible level where you can easily put it back together again, make a list of all the components and their amount. i.e., button panel x 1, small screws x 4 etc.

## TOP TIP

Think about numbering your components so you can easily identify them i.e., front casing is number 1 in your list and back casing is number 2 so on and so forth. This will let you create a list of components, and you will know how many you have when you get to the end.

## BONUS QUESTION

If you can take a photo of your dismantled product, see if you can label the components with numbers. A simple scrap bit of paper, post its or stickers will let you show which component is which on your list.



## CHALLENGE TWO: FANTASY VEHICLE

### THE IMPORTANCE OF COMMUNICATION

For this challenge you are going to learn about the importance of communication between designers and engineers.

When working on an engineering project, you will have to communicate challenges, potential solutions/designs and instructions to others in the team. This means that communication becomes a vital part of the engineering and design process.

### IT'S GOOD TO TALK

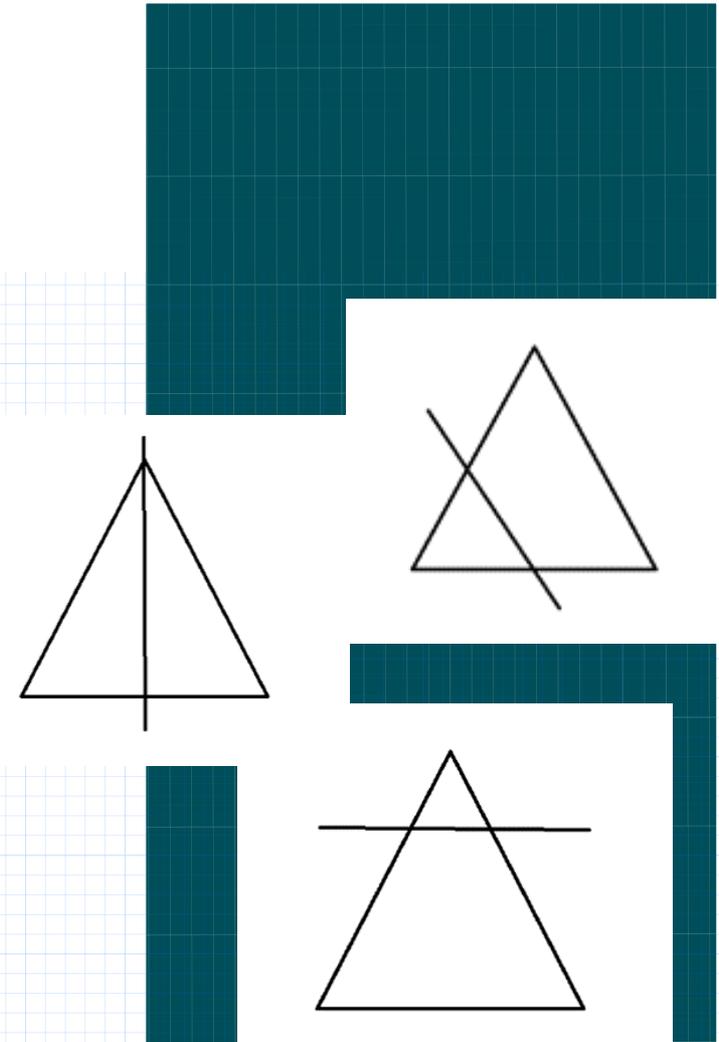
So, why is good communication so important? If I tell you to draw a triangle with a line through it you could draw any of these and be correct. The outcome might not be what you want but the required detail was not given to the person drawing the triangle and line.

### THE CHALLENGE

Design and draw a fantasy vehicle! It can be anything you can imagine. A flying ambulance with neon green headlights. A submarine that looks like a banana. ANYTHING! BUT... you have to write a very detailed description of your vehicle. As detailed as possible right down to the colour of the wheels and the size of the tyres or wings! When you are happy with your drawing and your detailed description you will give the description only to a friend or classmate. They will use your description to try to recreate your drawing to the best of their ability! Remember the more detailed your description the more accurate the recreation of your design will be. If you don't tell the person the laser cannon on top of your shark limousine is yellow, then they won't know to make it that colour!

### TOP TIP

Think about key defining elements of your vehicle so that the person recreating it knows what it will look like. For example, if you say the headlights are yellow remember to tell them they are big and round yellow headlights, that sit in the middle of the bumper, with a red trim around the outside. Detail in communication is key!



## CHALLENGE THREE: CAN OR CAN'T CARRY

### THE IMPORTANCE OF PLANNING

For this challenge you are going to learn about the importance of planning a design before progressing to modelling.

### PLAN AHEAD

Engineering projects often occur in response to the need to solve or assist with an issue or challenge. Thinking of a single solution might not be the best approach, as there is always more than one way to tackle a problem.

So why is design planning and having multiple concepts so important? There are several reasons:

- To make sure that you are solving the problem in a way that meets your brief - Are there time or budget limitations? Are you proposing a solution therefore in the most efficient way i.e. not spending more money than you need too, or ensuring you deliver on time?
- Confidence in your solution – going through multiple ideas will let you assess what is going to work well and just as importantly what won't work at all!

### THE CHALLENGE

Design and build a carrying device for 4 standard 330ml drinks cans. Your materials will include 4 sheets of A4 paper and 30cm of Sellotape.

Be careful not to waste your resources, as they are all you have. Take your time to plan your design on some other scrap paper with sketches and drawings. You should come up with 3 or 4 different ideas and try to think of pros and cons of each.

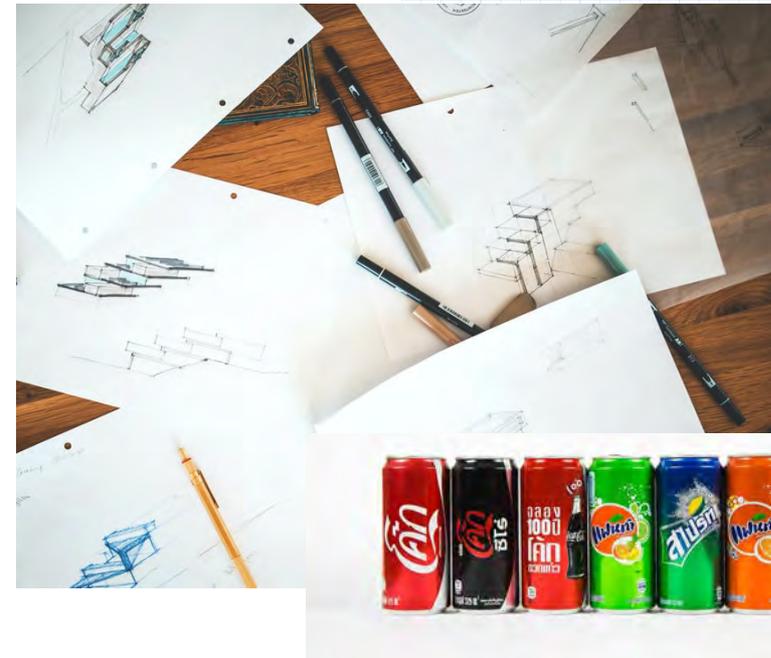
The device must carry the cans over a 10m distance using a single hand. The cans cannot be supported by the person's hand but must be lifted by ways of a handle or strap. No tape can directly touch a can, instead only the paper can come into contact with the can.

### TOP TIP

Think about multiple configurations and of these, what is best? Cans in a square 2X2, a long load stacked 4X1 or another arrangement?

### BONUS CHALLENGE

If you can carry the cans 10m already - can you repeat another 10m, but only with 1 finger. This will show how robust your design really is!



## CHALLENGE FOUR: SUSTAINABLE BUG HOTEL

### SUSTAINABILITY MATTERS

For this challenge you are going to build a sustainable bug hotel!

We must all work together to tackle climate change – and that includes engineers too. This means that sustainability is a key factor in engineering, from the designs developed and the impact they have on their surroundings and users, to the materials that are used and where they are sourced from.

### THE CHALLENGE

Design and build a bug hotel!

Get creative and use existing materials around your house that would end up in the bin otherwise, for example, you could use a milk carton, multiple clean washing up bottles or a shoe box.

Pick a solid structure and adapt it in a way so that you can fill it with lots of natural nooks and crannies for the bugs to explore, hide and sleep in. Bugs love natural materials like twigs and leaves, as well as a mixture of hard and soft places to sleep.

Fill your structure with well placed, stacked and secured materials. This is where your engineering brain will need to kick in. Think about how it can all fit in without using things like glue or Sellotape.

### TOP TIP

Consider sustainable materials that are built for purpose. A shoe box is great but won't last long in the rain unless it is undercover beside a shed or under a tree. Think about where the bug hotel is going to go and what the design needs to be/do. Will it hang on a wall? Will it have to sit on an uneven surface?

### BONUS QUESTION

If you can spot any bugs using your hotel, get a photo and see if you can identify what they are!



# WORKING WITH US

THE MALIN GROUP OFFERS YOU AN EXCITING RANGE OF EMPLOYMENT OPPORTUNITIES, FOR THE FUTURE, SPANNING A VARIETY OF SPECIALITIES.

With the Malin Group, you are not just joining a team, you're becoming part of a family. Our headquarters, based in the South Rotunda, Glasgow, reflect our group and culture - heritage teamed with innovation and creativity. Inside this historic building, classic features are teamed with modern facilities for our staff to enjoy - including pool table, ping pong, communal lounge area with fresh fruit and snacks, PS4 and a climbing wall. Our conference room also allows a 360 view of the city centre. We have regular social events, including First Friday Drinks, client football matches, and an Annual Ceilidh plus we have a few office dogs on occasion, which is always a nice addition!



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malin young engineers

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