

# Optional speaker notes

Upper primary version



ENGINEERS  
AUSTRALIA

## Introduction

Screen 1 (title screen – Make it so – you could be an engineer!)

Hi everyone. My name is \_\_\_\_\_ and I've come here today to talk to you about being an engineer.

So what is an engineer?

Screen 2 (popcorn)

So what would the world be like if there were no engineers?

Well, you couldn't make popcorn in a popcorn machine ...

Screen 3 (computer game)

... you couldn't play any games on the computer ...

Screen 4 (tap water)

... you couldn't even drink water out of a tap ...

Screen 5 (car movie)

... there's no way you could watch movies in the car ...

Screen 6 (Wii)

... and you couldn't play games like Wii or Playstation in your lounge room ... without an engineer!

Engineers worked out how to make all of these things possible. This is what an engineer does – engineers 'make it so' you can do all this, and more!

## Engineers

Screen 7 (subtitle screen: what's it all about)

So how do engineers 'make it so'? What are engineers?

Screen 8 (engineers are ...)

Well firstly, engineers are creative thinkers who really use their imagination. It's their job to work out the best way to fix a problem.

Often solving a problem involves finding a technical solution. This means engineers use maths and science to turn the cool ideas they have in their heads into real products that we can all use.

Turning a great idea into a real product can be complicated – that's why engineers like to work in teams. It's much easier to solve a problem with a team than on your own.

There are lots of things around us that engineers created. Engineers have designed and built almost everything you can think of! Here are just a few of the things engineers have helped make ...

Screen 9 (jets fly faster)

Planes were invented by engineers! Working out how to get a heavy piece of machinery to stay up in the sky was just the beginning. These days engineers are working on supersonic jet planes that are breaking all speed records.

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### Screen 10 (solar plant, environment)

Engineers are also working hard helping the environment.

Solar panels like these turn sunlight into electrical power which we can use in our homes, schools and workplaces.

Engineers are trying to find ways to improve solar panels so they are more efficient – using the same size panels to collect more energy. Solar power means less pollution in the air, so this is much better for the environment!

### Screen 11 (robots)

Did you know we already have robots working for us?

Engineers invented robot technology which is currently used in factories to make things like cars and machinery. Robot-guided equipment can make things much faster than a human can – although the robots still need a human to guide them!

Engineers are now looking at ways to extend robot technology to other areas. For example, engineers are experimenting with robots that could help us around the house. Maybe if you became an engineer, you could build a robot to clean your room for you!

### Screen 12 (outer space)

Engineers are also the people who took us into outer space!

How does the space shuttle get off the ground? How does the International Space Station stay in orbit around the Earth? And how do the astronauts stay alive in space, where there's no oxygen, or food and water? Working out how to make all these things happen is the engineers' job.

### Screen 13 (where do engineers work?)

These are just a few of the things that engineers have done.

So imagine you are an engineer. If you got up every morning to go to work, where do you think you would go?

### Screen 14 (where engineers work: Antarctica)

Here's one place you might not have thought of – Antarctica!

Australia has four scientific research stations in Antarctica. Electrical and mechanical engineers are based there to help the scientists keep all their equipment running. Engineers also help maintain all the machines that are used for day-to-day life: things like vehicles, water pumps, electrical power generators, heating equipment – and believe it or not, even refrigerators!

### Screen 15 (where engineers work: F1 car racing)

What about the race track? Yes, engineers are working here too!

All cars are built with the help of engineers. Formula 1 cars are specialised machines designed to go as fast as possible, and to stick to the race track as much as they can. Engineers are constantly working out how to 'make it so' these cars keep going faster, while still staying within the rules of Formula 1 racing.

### Screen 16 (where engineers work: music studios)

It's not all just about machines and buildings, though. Here's another unusual place to work – in a music studio!

Audio engineers work in music, film and TV. They help develop, set up and run the equipment used to record the music you listen to and the TV shows you watch. Next time you hear your favourite song or watch TV, remember that you wouldn't be able to experience it if an engineer hadn't made it possible.

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### Screen 17 (where engineers work: clothing)

What about the clothes you wear – do engineers have anything to do with these?

Well yes, engineers help invent new fabrics for our clothes. They could be working out in the field with crops, or inside a laboratory with fashion designers, or helping to solve problems at a factory where clothes are made. They invent special fabrics for things like the swimsuits that our swimmers wear at the Olympics, and the spacesuits that astronauts wear in space.

### Screen 18 (building site)

Engineers help work out how to construct the buildings around us, like houses, schools and shopping centres. Their job is to look at architectural plans and ensure the building is constructed safely for the environment it's in.

This can mean everything from solving problems like building on soft ground, to bringing drinking water from a long way away, to creating new construction materials that have never been used before.

## Case studies

### Screen 19 (case study intro screen)

Engineers have helped make some really amazing things. Here are just a few of them!

### Screen 20 (world's tallest building – screen 1)

This tower in Dubai is the tallest building in the world – and it's not even finished yet! When it is finished it will be 818 metres high, with 162 floors from top to bottom. The tallest building in Australia is 323 metres high – this tower is nearly 3 times as tall!

It is so tall that if you stacked 200 cars, end to end – it would still be taller! It cost \$1 billion US dollars to build, and it weighs the same as 100,000 elephants (and you need an engineer to help you weigh an elephant!).

This skyscraper is held up by concrete and steel rods. If you turned all the concrete into one long footpath, it would be 1,931 kilometres long. If you put all the steel rods together end to end, they would stretch more than a quarter of the way around the world.

That is one massive building!

### Screen 21 (world's tallest building – screen 2)

So how did engineers help create the world's tallest building?

The hardest part was making sure it doesn't move too much in a strong wind. Engineers worked out that they should vary the shape of the building as it got taller – so rather than one tall cylinder, the building is made up of a lot of different shapes. This way, when a strong wind hits the building it gets deflected along the building edges, so the force of the wind is reduced.

Such a huge building also needed new materials to hold up all the floors, so engineers developed concrete and steel beams that were stronger than the normal kind. Engineers also designed the building to be strong enough to survive an earthquake, and created a special system so the heavy building did not sink into the ground.

It takes a lot of hard thinking and team work to build something like this!

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### Screen 22 (world's fastest rollercoaster – screen 1)

Check out this gigantic rollercoaster – it's the fastest and the tallest rollercoaster ever!

This is the Kingda Ka Rollercoaster in America. When you step into one of the trains on this incredible ride, you'll accelerate from zero to 206 kilometres per hour – in 3.5 seconds! You'll also swoop through 90 degree turns and blast up to 45 stories high at the top of the loop, going so fast that you feel weightless – almost like going into space!

### Screen 23 (world's fastest rollercoaster – screen 2)

Engineers designed the entire track to maximise the height and angle of the turns – using science to work out the best ride! They also designed the tracks for stability and overall strength.

The rollercoaster uses hydraulics to push the trains along the track at massive speeds. Engineers worked out how to quickly push the trains to top speed while keeping it safe enough for people to use.

They also had to design the system so the trains stayed on the tracks, and the people stayed in their seats – even when they're upside down and moving at top speed!

### Screen 24 (wave energy – screen 1)

But engineering isn't always about the biggest and the fastest – sometimes it's about making a really simple idea work well. Take these for example – they might just look like balloons floating in the sea, but they could soon be running all the electricity in your home!

These buoys are part of a new kind of power station that uses waves instead of gas or coal. A normal power station burns fossil fuels to turn the turbines that create electricity, and this can damage the environment. Wave technology uses passing ocean waves to drive high-pressure water pumps that turn the turbines. Because there's no smoke, dirt or waste left over, it's much better for the planet.

### Screen 25 (wave energy – screen 2)

To create this new clean energy, engineers had to work out what size waves would drive the system. If the wave was too small or infrequent, then the buoys wouldn't move enough to create water pressure. If the waves were too big or rough, the buoys would get pulled off the sea floor and float away.

Then they had to find the places off the coast that had these kinds of waves, and set up a test station to see how well the system worked. These test buoys are just off the coast of Western Australia – I bet if you went past on a boat, you wouldn't even know that there was a brand new power station there!

### Screen 26 (hands-free games – screen 1)

Some of the best engineering is also the most fun – like making games even better! Engineers are working on ways to make new games where you don't even need to use a controller.

These games use a 3D camera that maps key points on your arms and legs then matches your movements with the game on the screen. So if you're playing a football game, all you have to do is kick your foot out and the ball on the screen will immediately bounce right back.

You could use this sort of game to learn how to drive a car, or try on some new clothes from a shop, or paint a mural on a wall – or maybe just practice a game on a wet afternoon!

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### Screen 27 (hands-free games – screen 2)

To make these games, engineers had to create a video camera that could see in 3D – in other words, it can separate your physical shape from the other things in the room, like tables and chairs. It also had to be able to follow your movements, and tell the difference between you and your friends so you can play the same game together.

And they had to design software that was fast enough to keep up with you – especially if you're a really fast player!

## Conclusion

### Screen 28 (you could be an engineer –vehicle/structure image)

So if you decided to be an engineer, you could help invent amazing things like new cars and buildings.

### Screen 29 (you could be an engineer –plan/diagram image)

Engineers look at the world around us and try to find ways to make it better. If you were an engineer you could do that too!

### Screen 30 (you could be an engineer –enviro image)

If you were an engineer, you could help find new technology to help the environment.

### Screen 31 (you could be an engineer –travel around the world)

Engineers work all over the world – and sometimes above it! One day you could be an engineer and work on the land, underground, underwater or even in space.

### Screen 32 (segue to activities)

You could use your imagination and MAKE IT SO your ideas become reality!

You can use your ideas and work out how to solve a problem in the next activity.\*

Let's give it a try.

\* this text can be altered/extended, depending on the activities you choose