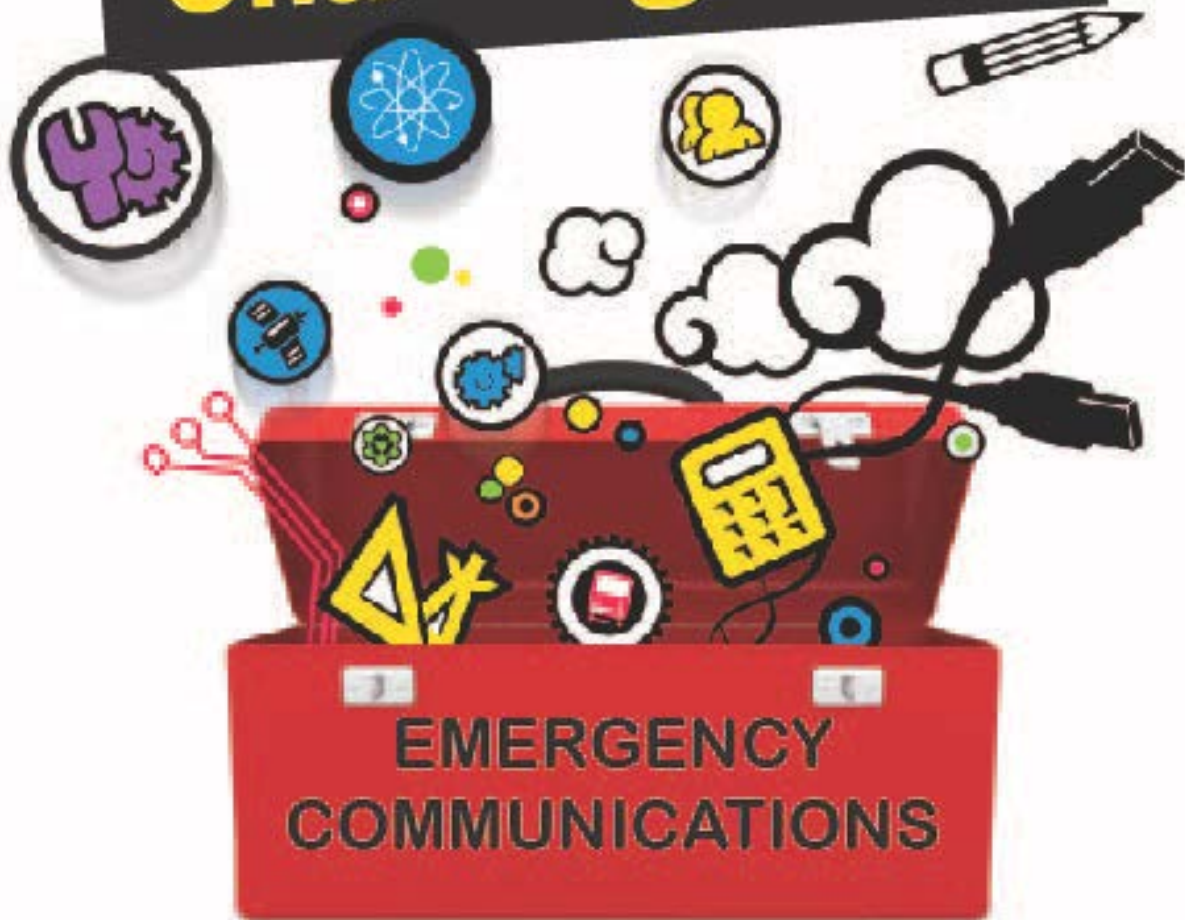
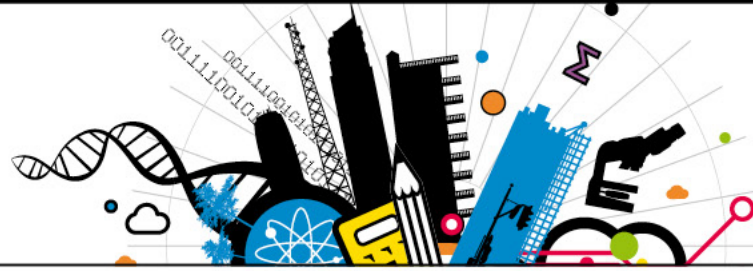


DIY Faraday Challenge Day



Introductory Presentation Slides and Notes

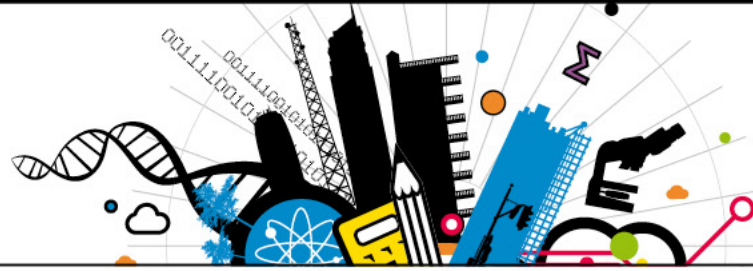


Emergency Communications Introductory Presentation

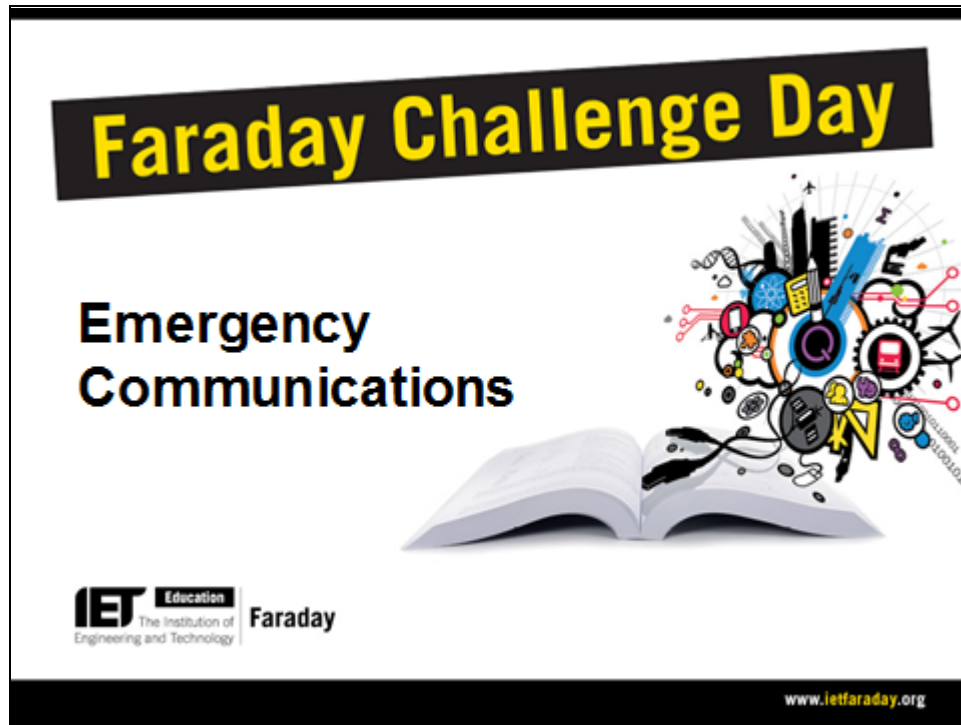
This booklet is a PDF copy of the introductory PowerPoint presentation for the Emergency Communications Faraday Challenge. You can use this presentation as a guide for both you and your students during the day. The PowerPoint presentation includes the use of some related film clips which can be found at the bottom of the resource page.

This booklet presents all of the presentation slides and accompanying notes, which included the use of the following files:

- 1. Emergency Communcations Introductory Presentation (PPT)**
Includes references to the video clips listed below (items 3-4) – you will need a video player installed on your computer which plays MP4 formats in order to view these video clips (digital media players are readily available to download for free online).
- 2. Emergency Communications Introductory Presentation Slides and Notes (PDF)**
- 3. Video clip: Emergency Communications briefing video**
- 4. Video clip: Mountain scenario (MP4)**
- 5. Sound effect: Drum roll**
- 6. Sounds effect: Helicopter**
- 7. Sound effect: Storm**



Slide 1



NOTES

- As students arrive, get them to fill out Team Registration form
- Use the 'Storm' sound effect found in the Teachers' Pack (AV Pack) to create atmosphere as students enter to school hall.

SCRIPT

- Welcome to the IET Challenge Day!
- The Faraday Challenge aims to encourage you all to consider a career in engineering or technology by helping you realise the ideas and knowledge you already have (perhaps even without realising it). Why is it important to introduce you to engineering? It is engineers that are vital when disaster strikes. When there are floods, hurricanes or earthquakes, it is engineers that are needed. And that is what today is about... Challenging you to the team of skilled engineers that come to the rescue in real-life crises.
- How many of you are considering a career in engineering or technology? Hopefully today will encourage many more of you to think about this area in the future.
- Before we get started.....Health and Safety/Housekeeping – by school contact



Slides 2 & 3

What is engineering?



**“The application of science to the needs of
humanity”**

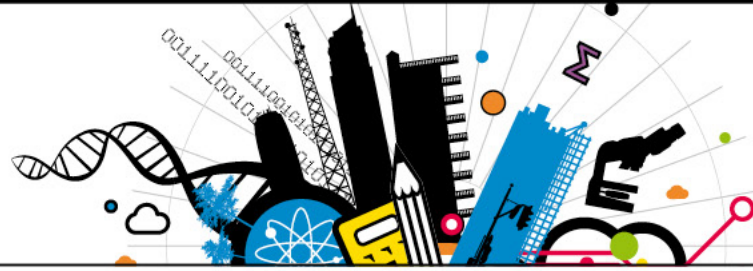
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NOTES

There are many types of engineer – highlight the range using the pictures on the slide. Highlight the wind turbine to emphasise that engineers are crucial in the role of sustainability.

You could ask the students if they can think of any other ways of producing electricity in a sustainable way. Define sustainability if required.



Slide 4



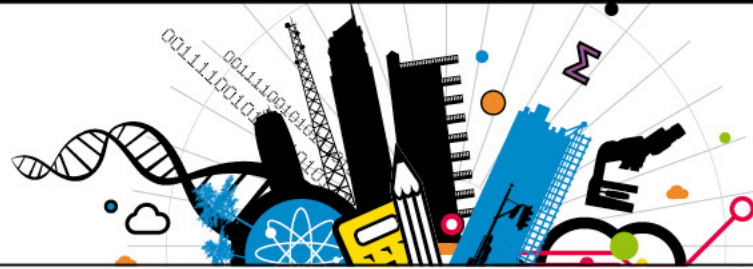
NOTES

Get students to huddle around presentation for this briefing especially where lighting is an issue.

Ensure that this slide is linked to the video briefing found in the Teachers' Pack. Alternatively you can play this file directly from the Teachers' Pack.


SCRIPT - Video briefing

To introduce the Challenge today, we have a real-life engineer. Pay close attention, as Natalie has key information about what you need to do today.



Slide 5

Re-cap of the Challenge



You are the **engineer rescue team** based in the town of **Alpha** which has been relatively unaffected by the extreme weather. **Beta** has been cut off so needs to be contacted but all communication systems are down.

What does your team need to do?

1. Design and build a prototype that will allow Alpha to send coded messages to Beta.
2. Create a code to send a message from Alpha across the mountains for decoding in Beta.

Why do you need to use code?

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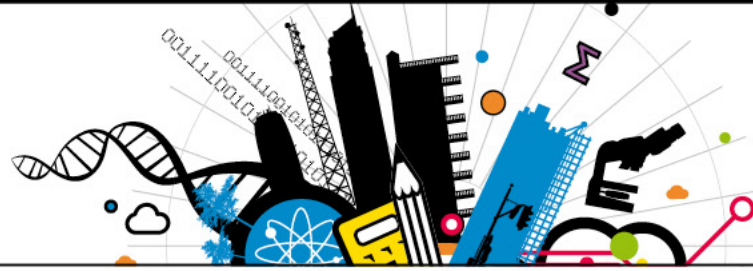
NOTES

At this stage it will be valuable to re-cap on the video briefing to ensure all students are clear about their task ahead.

SCRIPT

Remember what Natalie talked about in terms of how engineers work effectively together. You will need to work together as a team, think creatively and work within difficult conditions with a limited budget. Engineers are creative thinkers, let's see if you have the skills to be an engineer.

You've been given a lot of information, so remember to recap on your Challenge today. Use the slide.



Slide 6

Re-cap of the Final Test


Today's goal is to present and test your prototype and code

3 minutes

- Present to the Judges key points from your reflections

5 minutes

- Setup half the team in Alpha and half in Beta
- Rescue team in Alpha will be given a secret word to send to Beta using the prototype and code created
- Rescue team in Beta will need to decode the message as fast as possible and relay the message to the Judges for checking



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NOTES

At this stage it will be valuable to re-cap on the video briefing final outcome of the challenge to ensure all students are clear about their task ahead.

SCRIPT

Today we don't have real towns but we do have a real test! At the end of the day you will have to present and test your code and prototype. The winning team will receive a certificate for each team member (and anything else your school wishes to provide).

Presentation: You have reflection sheets to record your working process.

Test: Your prototype has to include an electrical circuit and has to be able to transmit a code.

Key things to remember:

1. Keep to time
2. Teamwork

Are there any questions so far?



Slide 7

Project Development



The key stages in developing your project today are:

Stage 1

- i. Brainstorming: Time to come up with lots of ideas for a prototype and code
- ii. Planning & research: Decide on the best idea and start planning how to build it

Stage 2

- i. Development: Build your prototype. Create coding sheets
- ii. Modifications: Improve on your prototype and code
- iii. Testing: Try sending a coded message within your team

Stage 3

- i. Prepare your presentation. Get your prototype and code ready for testing

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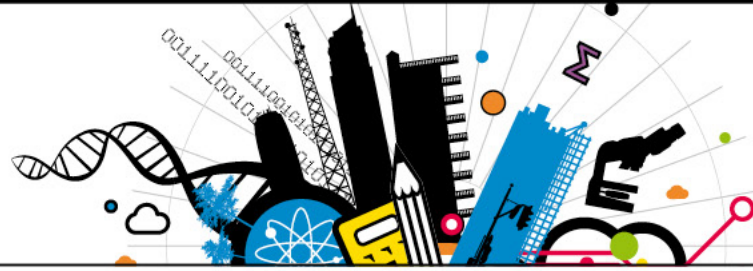
NOTES

This slide provides a snapshot of the day. Students should be reminded at each stage of their task.

SCRIPT


You will have some mini challenges ahead of you to ensure you're prepared for the final test!

I will remind you of each stage as we go along but it is important for you to work through each stage, give yourselves time to think about your ideas before you start building. It is vital that you have time to modify and test your prototype and code.




Slide 8

5 tips for working safely



1. Do not use mains electricity sources!
2. Keep your work station tidy and make sure there are no trip hazards
3. Use sharp implements safely and sensibly
4. Report any spillages, accidents, potential hazards to the Challenge Leader or a STEM Consultant immediately
5. If your appliance (bulb/buzzer) does not work straight away take the wires off the cell/battery immediately and check your circuit. You may have a short circuit which can make the wires very hot

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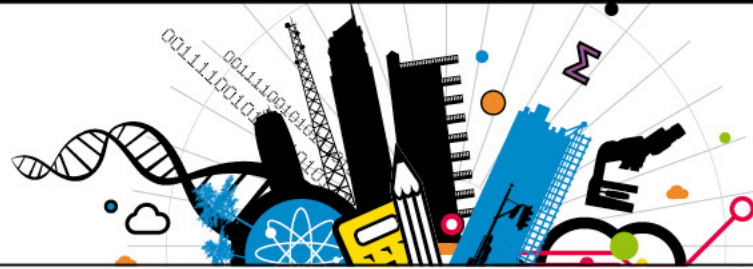
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SCRIPT

Before we get going, there are 5 top tips for working safely today.


Today and in real-life, an unsafe work environment can cause unnecessary injuries and in a crisis situation we don't want you adding to the casualties.

Key these top tips in mind throughout the day and remember that one of the areas you can score points in is in working safely and effective as a team.



Slide 9


Electrical circuit refresher



You have 10 minutes to make a bulb light using only,

- 1 bulb
- 1 1.5 volt cell / battery
- 1 red wire
- 1 black wire
- White Tak

Can you make the circuit with 2 black wires, 2 red wires, 1 wire only?



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NOTES

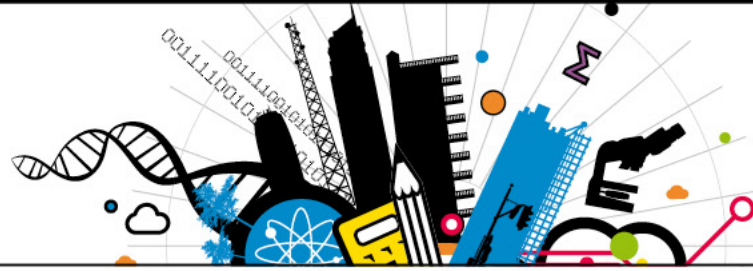
Students will need to use only the items they have been provided in their starter pack for this activity - 1 bulb, 1 1.5 volt cell / battery, 1 red wire, 1 black wire, White Tak. Teacher should wander around and prompt suggestions to support on this task. Be really sharp with 10 minutes giving a half-way and 2 minute warning.

SCRIPT

Creating a circuit is going to be an essential task today. Without electricity you will not be able to power your prototype and to score maximum points your prototype will need to include an electrical component. So, you may have put circuits together in class before but to refresh your memory we are going to quick hands-on activity.

Now, you have 10 minutes to make a bulb light up using only

- 1 bulb
- 1 1.5 volt cell
- 1 red wire
- 1 black wire
- White Tak



- If this is mastered, can you make the circuit with 2 black wires, 2 red wires, 1 wire only?

ADDITIONAL NOTES

For electrical circuits point out:

- Must be unbroken circuit of materials which conduct electricity – can incorporate a switch;
- Copper and its alloys are commonly used as materials to conduct electricity. There are 3 types of wires you can use today to build your circuit (red/black/bare), although they look different they have the same conductive capabilities.
- Must have power supply;
- Appliance can be a range of items – bulb, LED, motor, buzzer;
- Review – Once the 10 minutes is up, ask the room what are some of the key points about making a circuit.



Slide 10



Tools to help you

STEM knowledge and skills

- Engineers rely on science, design and technology and maths to be successful. Think about what you already know and how these can be applied creatively today!

Engineer rescue team brief

- Contains key info you need to know to be successful

[3D visualisation and terrain statistics](#)

- Help you to understand distances and heights of the scenario

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SCRIPT

To help you along the way there are a number of tools that you can use.

STEM knowledge and skills – Your brains!

- Engineers rely on science, design and technology and maths to be successful. Think about what you already know and how these can be applied creatively today!

Engineer rescue team brief – Student Booklets

- Contains key info you need to know to be successful

3D visualisation and terrain statistics – see AV Pack in Teachers' Pack

- Help you to understand distances and heights of the scenario – this is linked to 3D video found in Teachers' Pack.
- Play this and point out each town, the mountain and how comms is working. See page 4 of your pack.
- Even though today's test is only 5m you will be judged on awareness of real-life challenges – mountains and distance.



Slide 11

Tools to help you

- The Shop**
 - Purchase materials you will need to build your prototype
 - Limited supplies
- Budget**
 - 100 Faradays
 - Make sure you keep accurate records of all your purchases
- STEM Consultant**
 - Need expert advice? Use your budget to purchase consultancy time
- Inspiration Station**
 - Help get the creative ideas flowing



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SCRIPT

The Shop - refer to Student Briefing Pack page 5 for full list of materials and run through each item quickly

- Purchase materials you will need to build your prototype
- Limited supplies

Budget – spend wisely

- 100 Faradays
- Make sure to keep accurate records of all your purchases. You will be judged on your accounts.
- Spend as much as you need but you are operating in a crisis situation and so all resources need to be used wisely.
- Can sell back unused goods at the end of the session at half price
- You can only trade with the shop not with other teams. In real-life situation there would only be one engineering team
- No stealing!

STEM Consultant

Use your budget to purchase consultancy time for expert advice


Inspiration Station

- Help get the creative ideas flowing so is a good place to start
- BUT you cannot use any of the items from the inspiration station in your prototype. Marks will be taken off your team if you do.




Slide 12

How to a score points



| Criteria | Marks |
|---|-------------------------|
| Planning and research | 15 marks |
| Development of solutions, highlighting modifications | 20 mark |
| Accounting sheet | 15 marks |
| Presentation of reflections | 15 marks |
| Prototype | 15 marks |
| Code | 15 marks |
| Safe and effective teamwork | 10 marks |
| | Total: 105 marks |

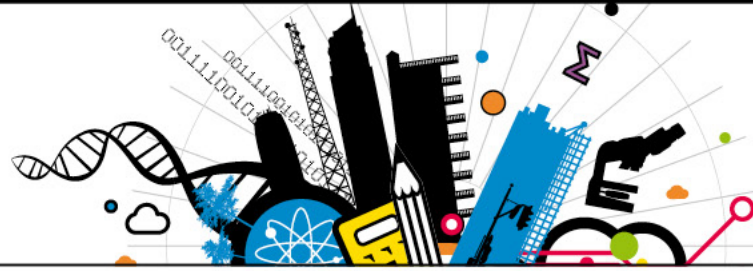


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SCRIPT

Don't forget this is a competition. Get to know how you can score maximum points by looking at page 8.




Slide 13


Role allocation

You have 10 minutes to:

1. Allocate each team member a specific role using job specifications sheets in the rescue team briefing
2. Read thoroughly your own job specification once allocated
3. Report back to your team about your duties for day
4. Make sure each team member is crystal clear about their job
5. Make up your lanyard badge



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NOTES

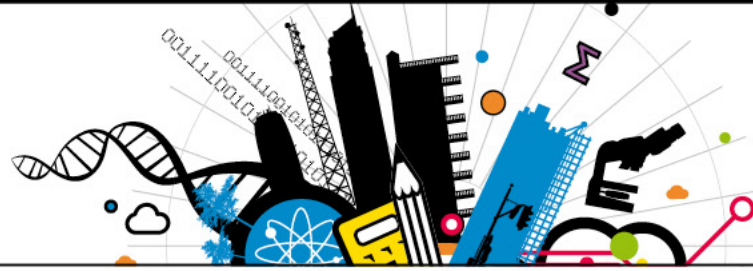
- It is vital at this stage that team members are allocated one of the 6 roles, read their job spec sheet to understand what they are required to do today, share their role with the rest of the team so their team know who to go to with questions and throughout the day ensure that each member is on task.
- Give only 10 minutes to do this with 5 minute warning
- Once 10 minutes is up, ask students to stand up when you call out their role to ensure that all roles are allocated and that they understand the key points of the role.
- When students stand up make a key point about role and ask them to look around at their competition
- Then ask them to call out some key duties specific to their role – reinforce with correct overview if they get it wrong. REPEAT for each role
- Collect in Student Team registration forms while they are doing this.

SCRIPT

In real life, engineers work in teams and their ability to work as a cohesive team is key to their success. Today, you are going to take on real-life roles to experience what it is like to be part of a problem solving team.


There is no time to lose so you have 10 minutes SHARP to allocate roles, fill out name tags and attach to the lanyards on the table, share duties with each other and report back that this is complete.

Don't forget you can score points for working effectively as a team!




Slide 15

Brainstorming



You have 15 minutes to:

1. Assess the scenario and write on your planning sheet what the main obstacles will be
2. Brainstorm solutions for how you will build your prototype and how you will create a code.



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NOTES

- See separate sheet for guidance as wandering around groups
- Give them 5 minute warning at 10.25

SCRIPT

There are 3 key stages today that you will go through before the final test. In stage one it is crucial that you understand what the problem is you need to overcome and brainstorm as many possible solutions as possible. Use the inspiration table. Great engineering needs great ideas as a start. Use your planning sheet to develop your ideas and remember to be neat and clear with your ideas as you will be marked on this. You can browse the shop but you cannot buy anything yet.

Engineers are good at thinking quickly about a situation and developing a range of solutions. Make sure you think about all the things you could do – be creative and be brave in your ideas.

You have 15 minutes.



Slide 16

Planning and research



As a team,

- Choose a prototype idea to develop
- Choose a method for encoding messages to develop
- Start planning what materials you need to purchase
- Complete stage 1 reflections – don't forget to fill out team number and name

Project Mangers come up for your briefing and bring with you starter packs
and team registration sheet

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SCRIPT

Now, you have had 15 minutes to brainstorm as many solutions for both the prototype you will build and the code you need to send and decipher your message. You now have 15 minutes as a team to decide what ideas you want to progress with, start planning what materials you need to purchase and complete stage 1 reflections. These are really important as they will remind you of the process you went through so you can talk about this in your final presentation.

Go!



Slide 18

Development

SHOP OPEN FOR BUSINESS

- Purchasing period – the Accountant may buy the materials needed
- Build prototype
- Develop coding and create coding sheets for your team

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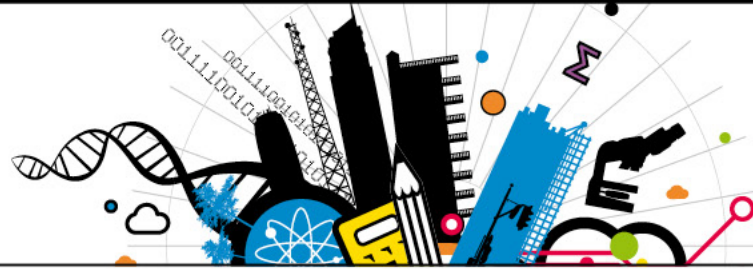
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NOTES

- Only the Accountant to purchase materials and keep record of expenses. Use the list in your pack to create a shopping list
- Electrical and Mechanical Engineer to commence build of communications device
- Cryptographers to develop language, create coding sheets/records
- Project managers – must keep team on task and to time

SCRIPT

Shop open for business! In this session you need to buy all the materials you need and can afford. You will need to make a start on building your prototype and creating your code. Transport will be arriving soon so work as quickly and smartly.



Slide 20

Modifications

- Brainstorm ideas to improve your prototype – can you make it stronger, more mobile, or the signal louder or brighter?
- Brainstorm ideas to improve your code – can you speed it up or make the signal easier to understand? Check out practice ideas in your brief.



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NOTES

5 minutes to regroup then continued building/development for 15 minutes

SCRIPT

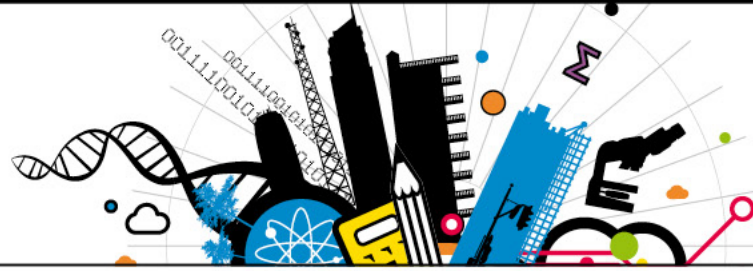
By this stage you should know what code you will be using and whether your prototype will be using light or sound to send this message.

This next stage is really important in making your solution the best. Take 5 minutes to regroup as a team and think of ways that you can modify or improve your solution.

Think about how you can gain marks in the assessment process by working together to problem solve and improve your initial ideas.

- *Cryptographers - can you speed this up or make the code easier to understand?*
- *Engineers - can you make this more mobile and stronger so you can transport it to the testing area? You don't want it falling apart leaving Beta in big trouble. How can you make the signal louder or brighter?*
- *Accountant – can you afford any further equipment needed?*
- *Project Manager - as a team choose which ideas are great and make them happen!*

It is often important that engineering teams sit down at regular intervals to review progress and modify their designs. You all have an important role to play in your team so regroup for 5 minutes and report on your progress.



Slide 21

Testing

- Test your solution! Does it work like you planned?
- Complete stage 2 reflections



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NOTES

- *Once device is ready, practice sending and receiving example messages provided*
- *Students should time how long it takes for your message to be transmitted and decoded over 5 metres using your experimental method.*
- *Can the prototype be moved to the testing station?*
- *Project Manager to support where needed and to complete Stage Two Reflections for these processes.*
- *Remind engineers to keep talking to each other as a team!*
- *Complete stage 2 reflections*

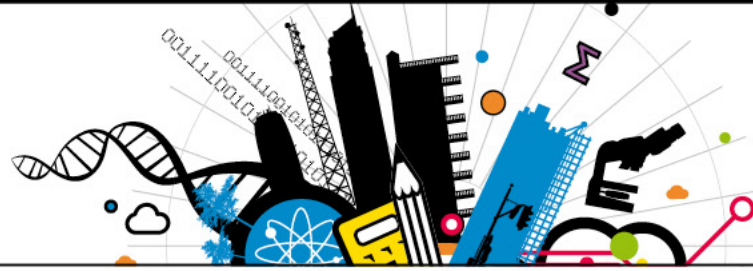
SCRIPT

Now, testing is crucial. As Natalie mentioned in the video briefing, testing of ideas and equipment is part of being a great engineer. If your circuit fails or your code can't be deciphered Beta will be in big trouble.

This is your chance to smooth out any bumps before the final test. You will also have around 30 minutes after lunch to make any final changes.

REMEMBER to complete your reflections

At 12.15 I will be coming round to each team to see if you can send a message within your team.



Slide 24

Stage 3

- Make final amends to your prototype
- Make sure you have everything you need to send and decipher a code
- Complete final reflections and prepare for 3 minute presentation which focuses on the science, engineering, technology and mathematics skills, knowledge and understanding you have used in developing your communications system.



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SCRIPT

- *This is where all your hard work needs to come together.*
- *You have half an hour to finalise the build of your prototype*
- *It would be wise to use this time to try sending and receiving practice messages*
- *Practice presenting reflections and timings – remember you only have 3 minutes: What key skills have you used?*
- *Accountant – Sell back to the shop any unwanted goods. The shop will be shutting in 30 mins.*



Slide 26

Transport has arrived!

Tools down!

You have 15 minutes to;

- Sell back any unused materials to the shop before it closes
- Project Managers need to submit accounting and planning sheets to Challenge Leader
- Finalise reflections for presentation
- Prepare for final demonstration



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NOTES

Collect balance sheet from Shop Manager.

SCRIPT

Transport has arrived!

Tools down - if you continue to work on your solution you will lose points

The shop is now shut.

You have 10 minutes to:

- Project managers submit your completed accounting and planning sheet
- Finalise reflections for your presentation
- Decide which members will go to Beta and which will remain in Alpha



Slide 29

Stage 4 - Presentation and Final testing



- **3 minutes** - Teams present reflections from Stages 1, 2 and 3.
- **5 minutes** - Demonstration of each team's communications system using an unknown message
- We will cut you off if you go over time!



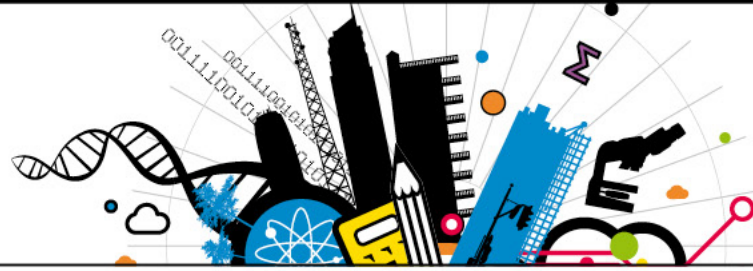
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NOTES

While part of the team is presenting reflections the rest of the team is setting up the prototype.

- Teams are randomly chosen to present their reflections
- Followed by demonstration of each team's communications system using an unknown message
- Team's come up to the front of their room to setup device – make sure they bring with them paper to record message
- Project Manager, supported by team, presents reflections
- Students should submit their Planning and Reflections and accounting sheet after their presentation.
- Teacher hands over unknown message to community A. Starts the timer:
 - 1 min to get set-up
 - 3 mins for presentation
 - Give team at Alpha the code envelope to transmit code. 5 mins



Slide 30



NOTES

Be sure celebrate all achievements by picking out strengths of each team. Before giving details of winner pick out specific engineering skills and interpersonal skills (e.g. technical skills, subject knowledge, structural engineering, perseverance, creative thinking, entrepreneurship, team work, leadership, communication) each team (or individual) has demonstrated which would support students in pursuing a career in engineering.

SCRIPT

Everyone showed real skills in teamwork, communication, Science, Maths, Technology and of course engineering. You should be really proud of you work as the Engineer rescue team.

Who now would consider a career in engineering and technology? Who has changed their minds about engineering as a result of today's challenge?

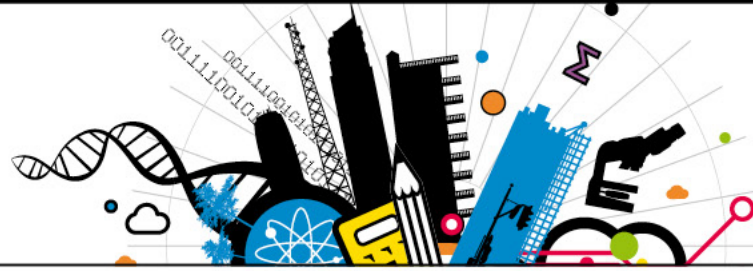
3rd place... Stand up and take a bow

2nd place... Stand up and take a bow

..... but there can only be one winner.

In 1st place..... **Gets students to stamp feet/clap hands/bang on tables**

(Alternatively, You may wish to use the drumroll sound effect found in the AV Pack within the Teachers' Pack to announce the winner).



The IET DIY Faraday Challenge Day 'Emergency Communications' is based on the Faraday Challenge Day of the same name, a STEM activity day written and delivered by the Attainment Partnership on behalf of the Institution of Engineering and Technology (IET).

The IET Faraday website hosts a wide range of teaching resources for science, design and technology and maths. These include classroom activities with film clips, online games, posters, careers resources and STEM activity days.

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