



◀ Train Design

◀ NAME

Learning Legacy Document

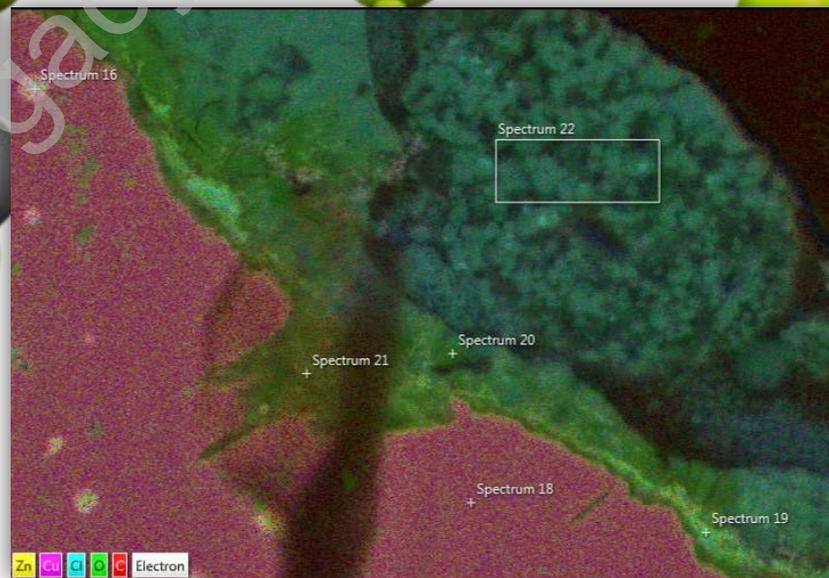
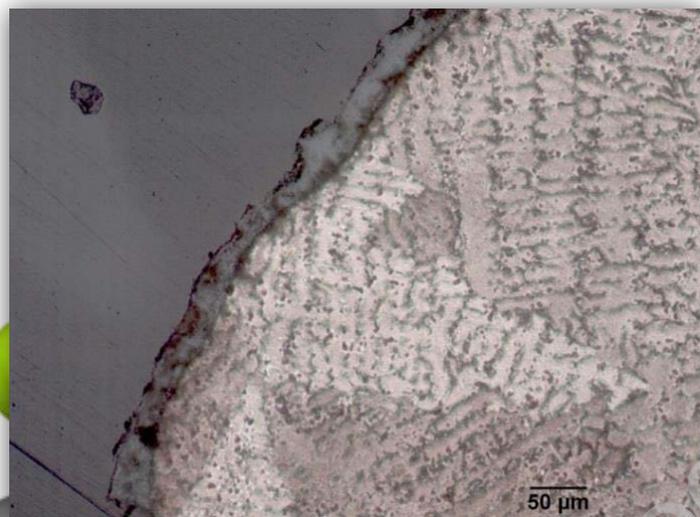




Who am I?



Chemical Engineer



Learning Legacy Document



Who is an engineer?



- ▶ An engineer is...
 - ◆ Engineers work with machines
 - ◆ Play 'Who is an Engineer?'

A



B



C



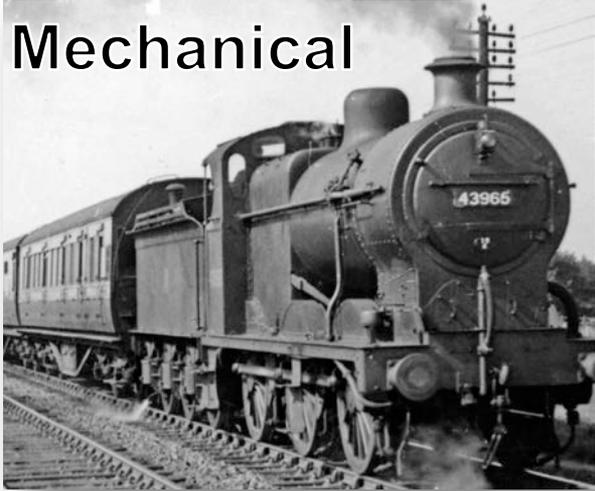
D



What do engineers do?



Mechanical



Railway

Robotics



Biomedical

Food



Chemical

Crossrail: A railway route east to west



Route Map

Showing rail and air connections

- Surface line
- Tunnel
- Portal (tunnel entrance and exit)
- National Rail connection
- Airport connection
- Airports not on the Crossrail route - to travel to these airports passengers will need to travel on other connecting rail services. Stop-free travel is possible but assistance will be required to get on and off some trains. Travel from Luton Airport Parkway Station to Luton Airport is via an accessible bus.





◀ Crossrail Railway Engineering

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Crossrail Engineers: Railways



Energy Efficient

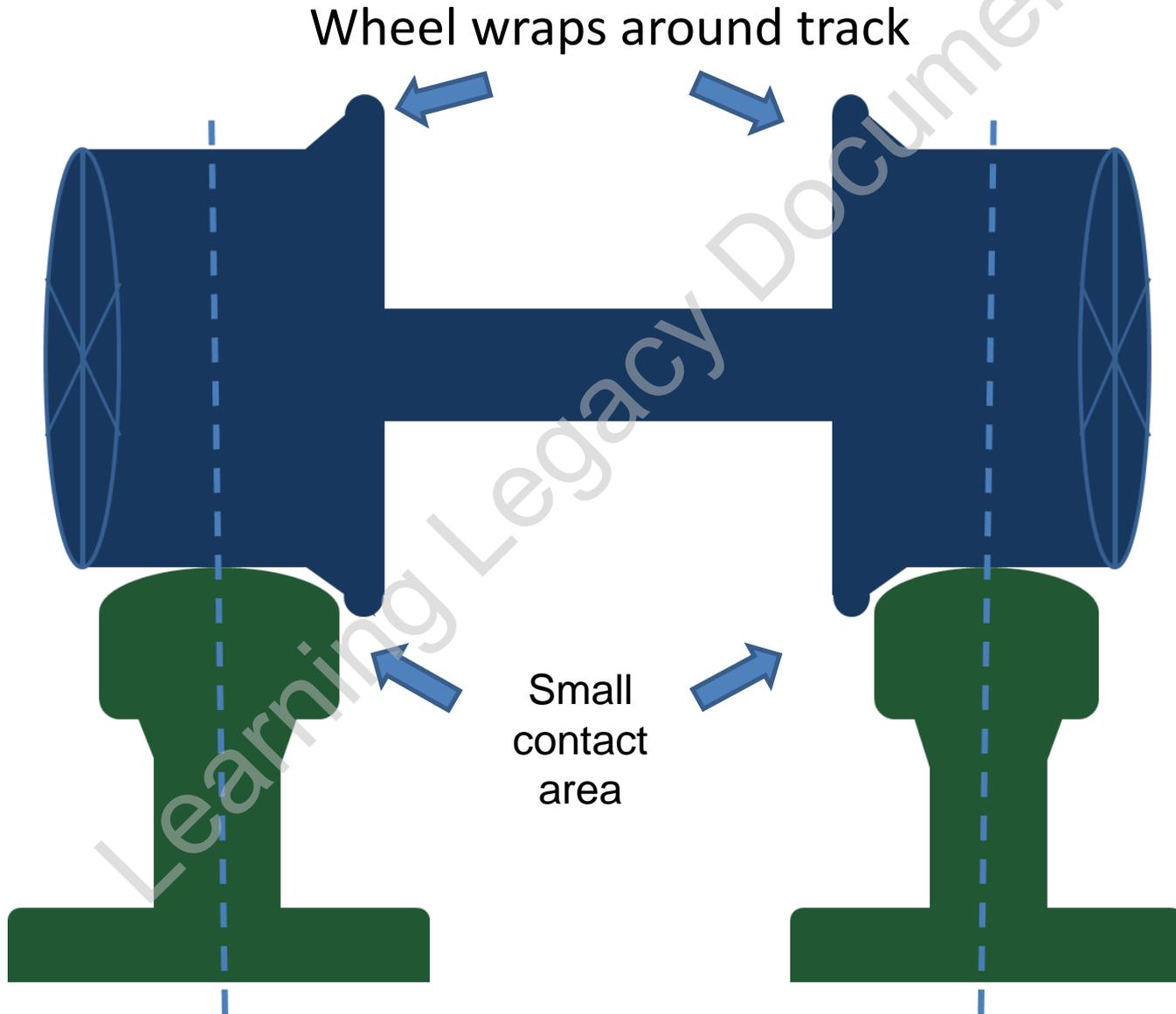
Safe!

Quick
Mass Transport





Train Wheels & Track

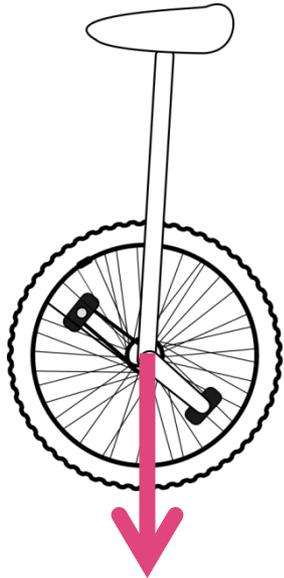




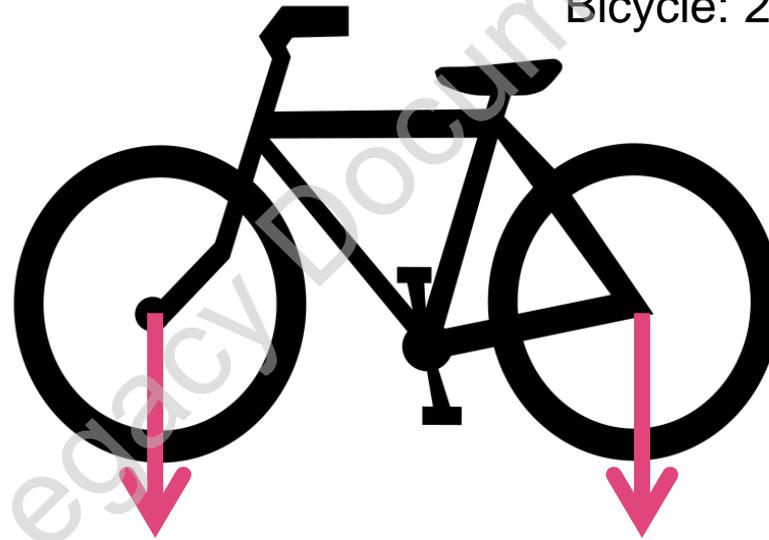
Challenge: Stability on Wheels



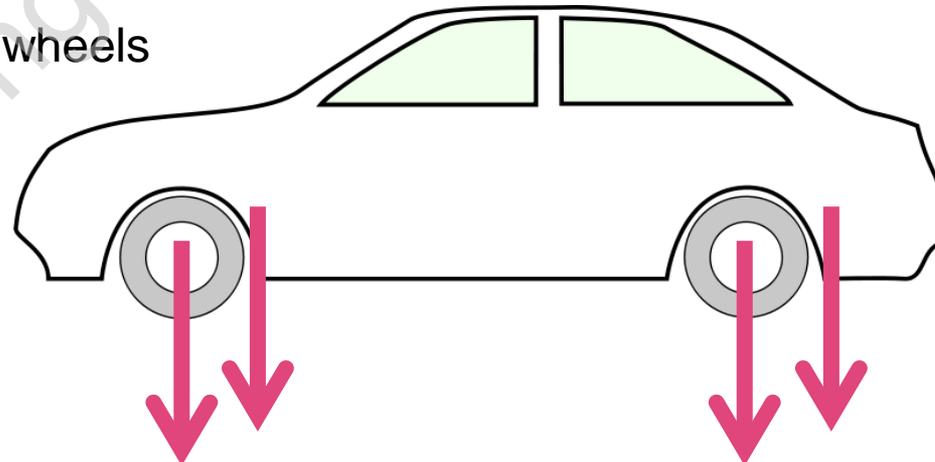
Unicycle: 1 wheel



Bicycle: 2 wheels



Car: 4 wheels



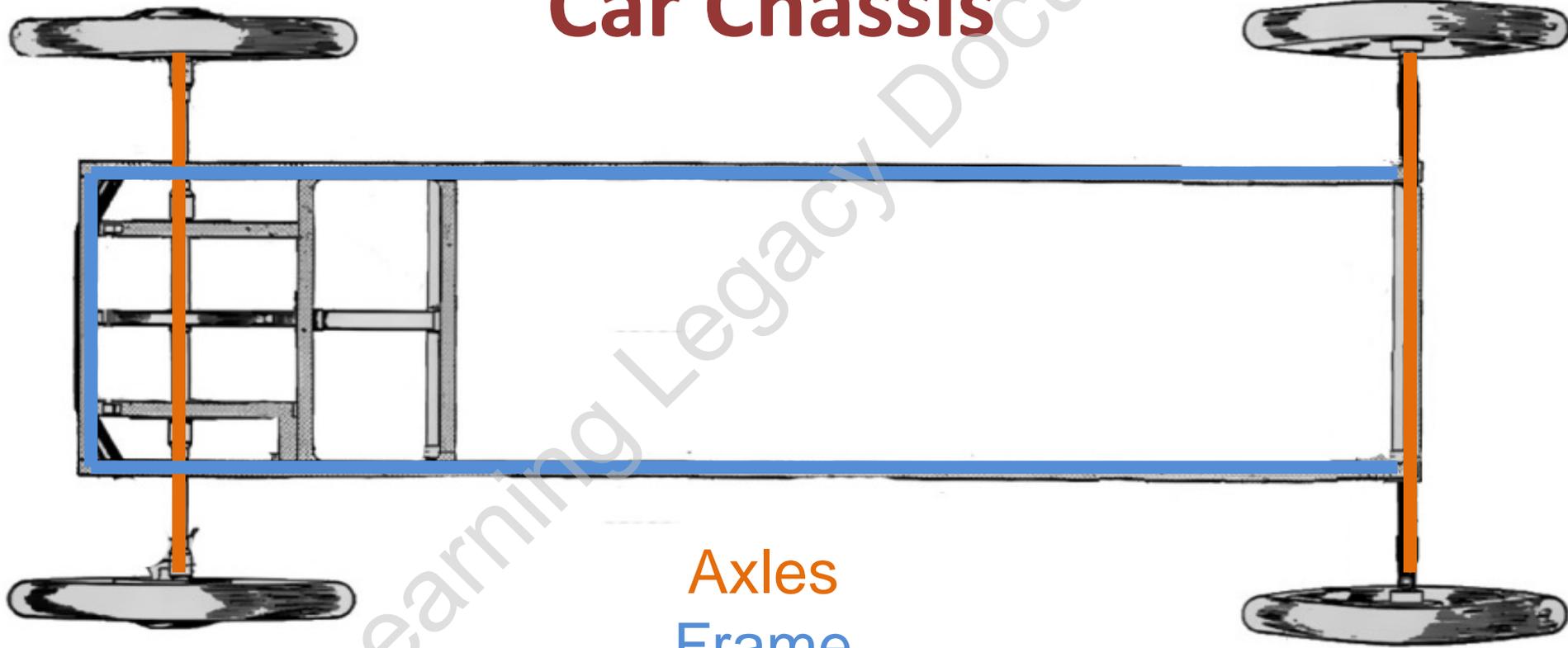
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Challenge: Frame to Axle



Car Chassis



Axles
Frame



◀ Engineering Challenge: Build Railway Wheel and Track

◀ How far will yours go?

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► Build a train car

- It must fit the size of the rail
- Wheels have to spin, not slide
- It must be able to hook onto your classmates' cars in front of and behind it





Design Process



Plan

1. Come up with division of labour
2. Make design plans and drawings



Build

3. Execute division of labour to build design following planned drawings



Test

4. Evaluate performance of design
5. Make adaptations where problems are found



◀ EVALUATION & PRESENTATION

- ◀ Show us how you roll!
- ◀ Explain your design

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Discussion



- ▶ Explain your carriage design.
- ▶ Does your carriage work? What could make it better?
- ▶ Did your design turn out how you thought it would?

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Do you need more help?



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Photo Credit (all others taken by Rachel Handel on behalf of Young Crossrail)

Slide 3

<http://en.wikipedia.org/wiki/File:Perfluorodecyl-chain-from-xtal-Mercury-3D-balls.png>

<http://met.sdsmt.edu/reu/2013/5/2.Report/Final%20Report.pdf>

Slide 4

A:<http://www.motorsport.com/#!/lemans/photo/main-gallery/leena-2/?i=11821&id=1062728&sz=1&s=2>

B:http://en.wikipedia.org/wiki/File:Atkinson_Rowan.jpg

C:http://commons.wikimedia.org/wiki/File:Possible_Self-Portrait_of_Leonardo_da_Vinci.jpg

D:http://en.wikipedia.org/wiki/Emily_Warren_Roebling

Slide 5

<http://en.wikipedia.org/wiki/Chocolate>

[http://commons.wikimedia.org/wiki/File:US_Navy_101005-N-2055M-](http://commons.wikimedia.org/wiki/File:US_Navy_101005-N-2055M-357_Navy_volunteers_are_framed_between_the_prosthetic_legs_of_a_Paralympic_Military_Sports_Camp_participant_at_Balboa_Naval.jpg)

[357_Navy_volunteers_are_framed_between_the_prosthetic_legs_of_a_Paralympic_Military_Sports_Camp_participant_at_Balboa_Naval.jpg](http://commons.wikimedia.org/wiki/File:US_Navy_101005-N-2055M-357_Navy_volunteers_are_framed_between_the_prosthetic_legs_of_a_Paralympic_Military_Sports_Camp_participant_at_Balboa_Naval.jpg)

http://commons.wikimedia.org/wiki/File:Walton_with_Leicester_-_Peterborough_East_train_geograph-2791492-by-Ben-Brooksbank.jpg

Slide 6

<http://www.crossrail.co.uk>

Slide 8

<http://en.wikipedia.org/wiki/Derailment>

Slide 10

Openclipart.org

Slide 11

http://upload.wikimedia.org/wikipedia/commons/e/e6/GWK_chassis_%28Autocar_Handbook%2C_Ninth_edition%29.jpg