



## Technology @ Te Papa – Education Programme Formula One™ – The Great Design Race

### Suitability

Years 1–12.

The programme is based on Level 4 of the curriculum

Please let us know if your class is focussing on a particular aspect of NCEA Technology when you book your programme.

### Length of programme

60 minutes

### Vision

**Lifelong learners:** Students will be encouraged to actively seek and create their own knowledge about design evolution and technological development.

### Principles

**Learning to learn:** Students will be encouraged to continually reflect on their own knowledge and learning throughout the programme.

**Future focus:** Students will be encouraged to think about future issues, such as sustainability and enterprise, and the solutions that will affect Formula One racing.

### Values

**Innovation, inquiry, and curiosity:** Students will explore how critical, creative, and reflective thinking has shaped design evolution and technological development.

**Excellence:** Students will see what can be achieved through aiming high and maintaining high standards.

## Key competencies

Thinking: Students will use creative, critical, and metacognitive processes to develop their understanding of design changes and technological advances.

Relating to others: Students will share ideas, listen actively, and work together to come up with new ideas and ways of thinking about design evolution and technological development.

## Focus learning area

Technology

## Strands

**Technological practice:** Students will examine the technological practice of Formula One and investigate the issues that have led to recent technological practice.

Level 4

### Brief Development

Justify the nature of an intended outcome in relation to the need or opportunity. Describe the key attributes identified in stake holder feedback, which will inform the development of an outcome and its evaluation.

**Technological knowledge:** Students develop knowledge that is particular to the technological environment of Formula One and understand how and why the cars work.

Level 4

### Technological Products

Understand that materials can be formed, manipulated, or transformed to enhance the fitness for purpose of a technological product

**Nature of Technology:** Students will learn to critique the impact of Formula One technology on society between the years 1950 and 2009, and to assess how outcomes are valued by different people.

Level 4

### Characteristics of Technology

Understand how technological development expands human possibilities and how technology draws on knowledge from a wide range of disciplines.

## Programme overview

This education programme will give students the opportunity to explore Technological knowledge, Technological practice and the Nature of Technology within the *Formula One™ - The Great Design Race* exhibition. Students will explore some of the technology and design elements involved in Formula One and how they have changed and been validated over time.

The programme will focus around the cars featured in this exhibition: Lotus 16, Cooper T51, Brabham BT20, McLaren M7A, BRM P160, McLaren-Honda MP4/4, Williams FW14B, Ferrari F2004 and the McLaren MP4/21, as well as highlighting some world class NZ drivers: Bruce McLaren, Denny Hulme, and Chris Amon.

There will be opportunities for students to hands-on explore some safety gear and car parts, as well as some design materials.

## Learning outcomes

### Students will be able to:

- Identify three New Zealand Formula One Drivers
- Discuss technological innovations and changes in Formula One racing cars
- Discuss design changes in Formula One racing cars
- Identify important safety features in Formula One Cars

## Pre and post-visit activities

- Research famous Formula One drivers. What does it take to become a Formula One driver? What particular skills are needed?
- Design and create a working racing car with team name and logos. Create and agree to rules that the cars must conform to: maximum and minimum heights, lengths, weights, etc. Race the cars against each other on 'Grand Prix' day.
- In groups, students design their own Formula One event. They investigate what is needed to run a successful event, researching all levels from crews to sponsorship. They then put together a proposal of the benefits such an event would bring to their city – developing and encouraging ideas of innovation and enterprise.
- Follow the 2009 Formula One Season with a results board for each race and overall standings. Predict who will win the Drivers' and Constructors' Championships.
- Choose an on-road car popular in New Zealand – find out its overall weight, and weights of particular car components (such as wheel, engine, the body, etc) and compare these weights to that of a chosen F1 car.

- Design and create a race track – what is the optimum length, number of straights, hairpins etc of a good Formula One race track? Find out the favourite track/s of various drivers.
- Create a Formula One board game.
- Class Debates:
  - Formula One has no impact on the environment.
  - Pros and cons of KERS (Kinetic energy recovery system) – should it be mandatory in the 2010 season?
  - What's more important in winning a Formula One race – a great driver or a great car?
- Students look at photos of Formula One racing cars of the past and present and sketch a car from each era. Identify problems that designers needed to overcome, e.g. drag, friction, etc. Identify and label how F1 cars have evolved and how designers have come up with structural ideas to reduce problems as much as possible. Students then link and apply this knowledge in designing their 'F1 car of the future' using the most appropriate materials and technology.
- Carry out experiments relating to velocity, mass, force, and friction e.g.:

Make a long ramp by laying a piece of wood against an elevated surface.

Use a range of toy cars to investigate the relationships between velocity, force, and mass. What happens to velocity when a heavier car is used? What happens when the surface of the ramp changes (increase friction by laying down a carpet square)? What happens when the gradient of the ramp is changed?

Take two cars – one light and one relatively heavy – and push them over a smooth surface. Which travels further?

Students draw conclusions from their investigations regarding the mass, size, and aerodynamics of each car tested. They then make connections between this knowledge and the design and structure of the cars they are designing. (Should they use heavy or light material? What would the best wheel surface be? Are big or small wheels better? How can drag and friction be reduced?)

- Invite a go-kart enthusiast or someone from a local kart club to come and talk to the class about the main parts of a kart: steering and braking and the intricacies of racing. Students would have prepared a list of questions they want to ask to help them with their design brief for their own class project (see recommended website below on building a go-kart).

### **Build your own go-kart!**

[http://www.things2make.com/things2make\\_files/instructions%20over%205/gokart.htm](http://www.things2make.com/things2make_files/instructions%20over%205/gokart.htm)

[http://www.kartbuilding.net/Wooden\\_Go-Kart\\_Plans/index.html](http://www.kartbuilding.net/Wooden_Go-Kart_Plans/index.html)

## Some good websites to check out:

### [Sebastian Vettel explains 2009 F1 rule changes](#)

2 min 23 sec

A fantastic computer-animated clip featuring Red Bull Racing's Sebastian Vettel and Mark Webber racing on track, with Vettel showing you the 2009 rule changes – the biggest in Formula One history.

### [www.f1fanatic.co.uk/](http://www.f1fanatic.co.uk/)

Website featuring video, analysis, comments on Formula One news, history, and biographies. Fantastic images of the 2009 season Formula One cars, as well as great wallpaper downloads.

### <http://www.allf1.info/>

Statistics and galleries. Of particular use is the Constructors' Championships which lists years, cars, and drivers from each team from 1958–2008, including an image for each car discussed. Also has Grand Prix history, images of past and present tracks, and information and images charting the evolution of engines from each team.

### <http://www.francoandformulafun.com/>

Capturing the spirit of Formula One, this is a site that young children can relate to and interact with. The website includes games for young children, an interactive story book read by Murray Walker, a picture gallery for kids to share their work, and downloadable colouring-in pages.

### <http://www.discoverychannel.co.uk/video/shows/the-secret-life-of-formula-1/>

This site includes video clips (around 5 minutes long) covering such topics as Aerodynamics, Drivers, Links between Aviation and F1, and Launch control. More suited to senior students, however the themes and images could be used with younger students provided that teachers could further break down the complex ideas covered.

### <http://www.bruce-mclaren.com/about-bruce-mclaren>

Includes extensive autobiographical and biographical material about Bruce McLaren, as well as an image gallery and information about the cars he raced and the Trust set up in his name.

### <http://www.grandprix.com/gpe/drv-mclbru.html>

General information about Bruce McLaren's racing history.

### <http://www.f1complete.com/content/view/411/273/>

Statistics and biographies for Bruce McLaren and Chris Amon.

### <http://www.sergent.com.au/nzdrivers.html>

Basic statistics for New Zealand Drivers 1949–1976

### <http://www.f1fanatic.co.uk/2009/02/02/formula-1s-lost-nations-new-zealand/>

Article on New Zealanders' great accomplishments in F1, and what we may be able to look forward to in the future.

[http://en.wikipedia.org/wiki/Category:New\\_Zealand\\_Formula\\_One\\_drivers](http://en.wikipedia.org/wiki/Category:New_Zealand_Formula_One_drivers)

Use this page to navigate to more detailed information on drivers such as Chris Amon, Denny Hulme, Bruce McLaren, Howden Ganley, and Graham McRae.

[http://ndtv.f1pulse.com/drivers/Denny\\_Hulme/3B413F/drivers\\_profile.aspx](http://ndtv.f1pulse.com/drivers/Denny_Hulme/3B413F/drivers_profile.aspx)

Racing statistics and biographical information on Denny Hulme.

[http://ndtv.f1pulse.com/drivers/Amon\\_Chris/3B3C42/drivers\\_profile.aspx](http://ndtv.f1pulse.com/drivers/Amon_Chris/3B3C42/drivers_profile.aspx)

Racing statistics and biographical information on Chris Amon