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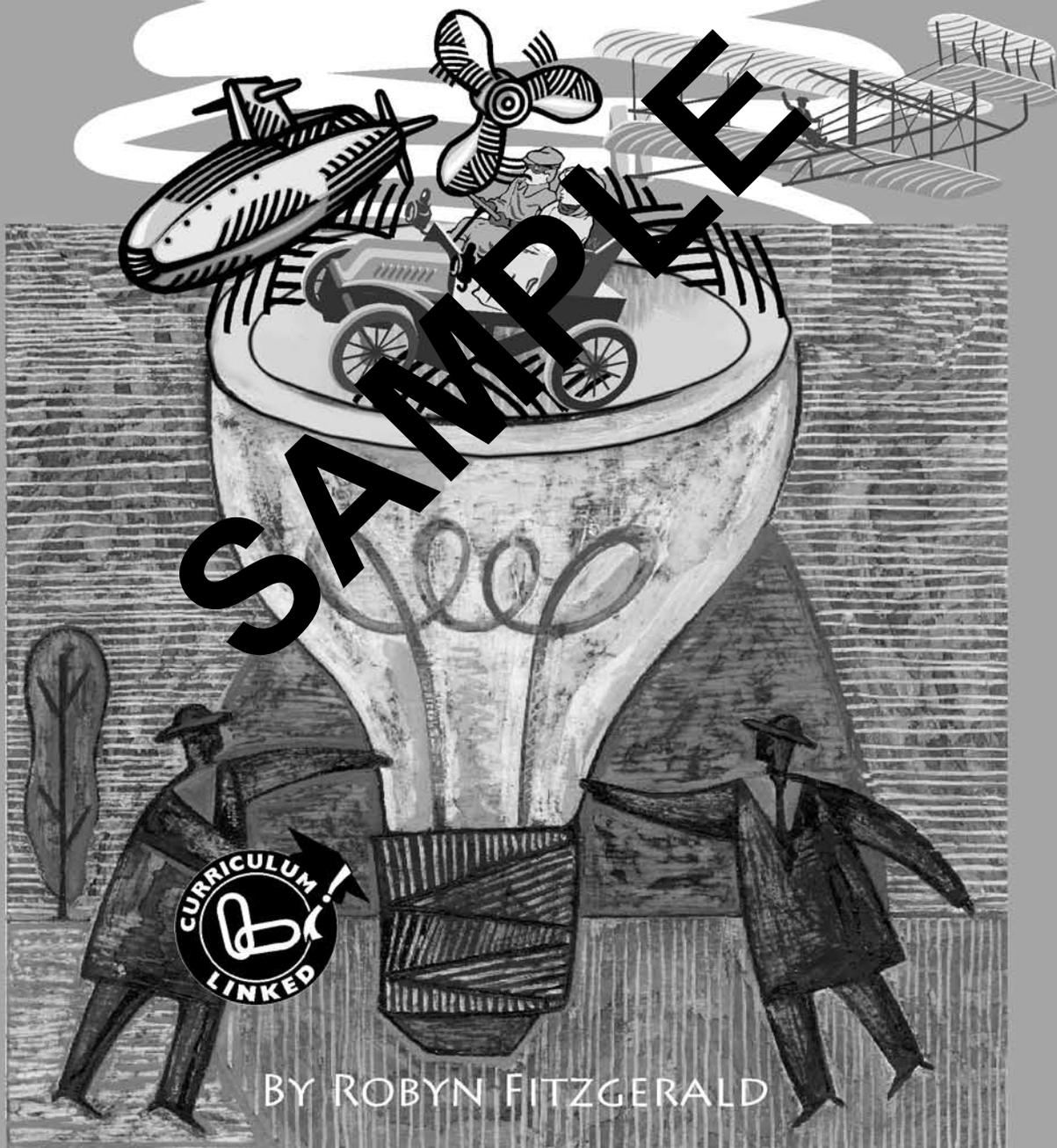


For 9-13 years



# FANTASTIC INVENTIONS

THE EARLIEST AND MOST RECENT LAND, AIR AND SEA CREATIONS WHICH WILL BOTH ENGAGE AND AMAZE.



BY ROBYN FITZGERALD

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# Teachers' Notes

Fantastic Inventions examines how past, current and future inventions consistently affect our modes of transport, our lifestyles and the environment. It details dramatic technological leaps that have changed land, sea and air transport forever.

The Land Section covers the invention of early engine design, including Nicolaus Otto's internal combustion. These early inventions are compared to a modern day hybrid petrol and electric car; the Pyrius. In this section, students are guided to design their own car/hybrid means of transport. Students are encouraged to draw on their knowledge of science fiction in popular culture such as the transport devices in the Star Wars trilogy movies and various superheroes' transport (e.g. the Bat mobile) to assist them to process and enjoy this topic.

The Air Section focuses on the Wright brothers' early plane. This method of transport is compared to the Boeing 747 and the new Airbus. Other fantastic technological leaps that are explored include orbital and suborbital space planes and a secret supersonic jet engine.

The Sea Section explores past, present and future methods of travelling by sea and focuses on the development of the submarine, with reference to James Bond-like underwater cars. Your students will enjoy making a working submarine from a soda drink bottle!

Fantastic Inventions is highly relevant to the themes of English, Society and Environment / History and Technology and Enterprise. It is designed at upper primary students, however the activities can be easily adapted to suit younger students.

**SAMPLE**

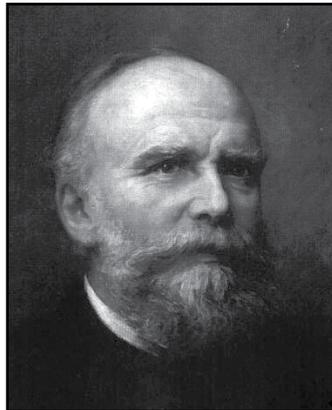


## The Innovations of Otto, Langen and Wankel

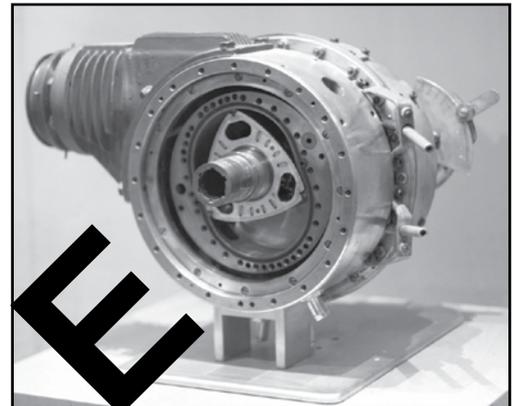
► Read the information below.



Nicolaus Otto, *Wikimedia Commons*



Eugen Langen, *Wikimedia Commons*



Wankel rotary engine, *Wikimedia Commons*

Nicolaus Otto was born in 1832 in Germany and died in 1891. He finished school and delivered groceries to make a living. When he was growing up, trains and cars were powered by steam. Steam driven cars were so noisy that they damaged roads in Europe and Britain and were very **impractical** for the unpaved roads in Australia.

Otto was deeply interested in technical inventions and during his lifetime he invented engines which were powered by coal, gas and air. The 'explosion' of fuel was contained inside the engines. These types of engines generated far more power and were safe machines. The petrol designed engines that we know today are based on Otto's designs.

Otto patented the first successful two stroke engine in 1861 together with Eugen Langen. This engine was practical for everyday transport. Langen owned a sugar cane factory, so he could afford to help Otto set up the first engine manufacturing company in the world.

In 1876, Otto and Langen built a two stroke engine in their own factory. Their invention won a gold medal at the World's Fair, where new inventions were **showcased** to the world.

Also, in 1876, Otto built the first four stroke **piston** cycle internal combustion engine. It burned air and fuel. Over the next ten years, 30,000 of these engines were sold.

Today, 100s of millions of these engines are sold for boats, tractors, aircraft, **motorcycles** and industrial engines.

Felix Wankel was another great inventor born in Germany. In 1957, he invented the Wankel rotary engine. A rotary engine contains a rotor or turning piston, which moves in a circular motion, so it goes around instead of having pistons pump up and down.

Mazda have shown a lot of interest in the Wankel rotary engine and have managed to improve it.



# Aerodynamic Forces Activity

► Read the information on page 22 to help you to complete the activities on this page.

## \* Questions

1. Write down your own definition of drag.

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2. Which aerodynamic forces must be greater than drag and weight for a plane to move forward?

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3. Name the two forces which pull a plane towards the ground and slow lift.

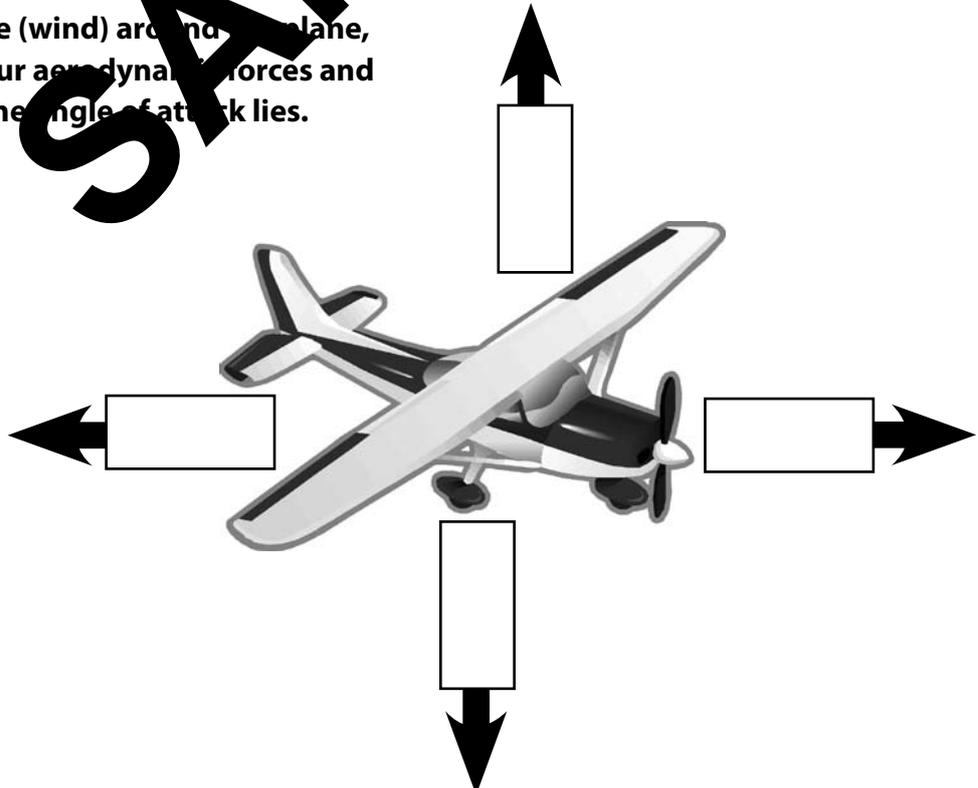
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4. What is another name for the design of a plane wing? 

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## \* Label the diagram

Draw air pressure (wind) around the plane, then label the four aerodynamic forces and indicate where the angle of attack lies.





Submarines are vessels that travel underwater. The people who sail on submarines are called submariners. Submariners discovered many centuries ago how to dive and surface a submarine, but like cars and planes, submarines only became practical in the early 20th century with the invention of electrical motors, batteries and diesel engines. In the 20th century, nuclear power was invented.

