

# Aerodynamics

By Leighton Frain



# Introduction

- ▶ **Aerodynamics** is the study of forces and the resulting motion of objects through the air.
- ▶ Almost all vehicles are designed to be aerodynamic for several reasons, but mostly for fuel efficiency or speed.
- ▶ People test if vehicles are aerodynamic or not by putting them in wind tunnels.

# Cars

- ▶ The primary purpose of a car is to get from one place to another.
- ▶ The secondary purpose is how it gets there or what it gets there.
- ▶ Supercars are designed to be very aerodynamic, so that they can reach maximum speeds and stay stable, and cut through the air.
- ▶ Family cars are designed to carry several passengers as well as luggage, so are usually a lot less aerodynamic.
- ▶ Off road cars sacrifice a lot of aerodynamics so they can have large ground clearance
- ▶ Lorries, sacrifice almost all aerodynamics to carry large loads, but do so a lot slower



# Trains



- ▶ There are different types of trains, Mainline trains, Branch line trains and Freight Trains.
- ▶ Mainline trains pick up passengers then travel a long way before dropping them off, so in between stations they can get up to high speeds. They have a long nose on the front so the air moves freely around them.
- ▶ Branch line trains pick up passengers frequently and usually don't get up to high speeds between stops, so it is not as important to be aerodynamic.
- ▶ Freight trains take heavy loads very far, but like lorries don't get up to high speeds so are usually not as aerodynamic



# Planes



- ▶ The most important thing about the aerodynamics of a plane is how it gets off the ground.
- ▶ The shape of the wings when pushed through the air, create different pressure above and below the wing, higher pressure below the wing causes 'Lift' which gets the plane in the air.
- ▶ Steering a plane is done by using flaps and a rudder which changes the shape of the wing, causing higher pressure under one wing will make the plane bank.
- ▶ The engines on a plane are only there to create forward movement.



# Boats



- ▶ Aerodynamics are not as important on a boat as the water resistance.
- ▶ Water resistance is the friction of the water against the moving boat.
- ▶ The bottom of a boat is called the hull, it is designed to cut through the water and then send the water around the boat smoothly.
- ▶ Some fast boats are designed to lift out of the water, so there is very little contact between the boat and the water, minimising the friction of the water on the hull.

