

Forces

3. Contact Forces

CONCEPT 1

LESSON GUIDE

FRICION AND DRAG

PRECISE LEARNING POINTS

KNOW

I know that friction is a force that acts against the motion of an object.

APPLY

I can apply my knowledge of friction to explain the drag on objects as they move through a liquid.

EXTEND

I can extend my knowledge of friction and drag to explain how to make objects more streamlined.

NOTES

Whenever an object moves against another object, it feels **frictional forces**. These forces act in the opposite direction to the movement. Friction makes it more difficult for things to move. This resistance to movement is what we call **drag**. On Earth we feel drag when we or objects move through a fluid. A fluid in science is a key term we use to describe any material that will flow, liquids and gases.

Bikes, cars and other moving objects experience **air resistance** as they move. Air resistance is caused by the frictional forces of the air against the vehicle. The faster the vehicle moves, the bigger the air resistance becomes. The top speed of a vehicle is reached when the force from the cyclist or engine is balanced by air resistance. This is also true for animals that move through a fluid. For example, some birds can move very quickly through a fluid, this is because they can change their shape to cause little drag, this is known as streamlining. Racing cyclists crouch down low on their bikes to reduce the air resistance on them. This helps them to cycle faster. They also wear streamlined helmets. These have special, smooth shapes that allow the air to flow over the cyclist more easily. Engineers have used these ideas from nature to build vehicles that are streamlined. Modern vehicles are also streamlined. Their smooth shapes make the air resistance smaller, which allows them to travel further on the same amount of fuel.

Sometimes drag is a disadvantage as we want objects to flow through a fluid as easily as possible. But sometimes it can be helpful, for example (from nature again) when birds come down to land, they change their shape again in order to slow down.



Similarly, an airliner needs reduced drag when it is in flight but when landing needs to increase drag in order to slow down safely. Cars have breaks to reduce drag, where one solid pushes on another to cause friction and slow the vehicle down. Other examples of this includes;

- friction between our shoes and the floor stop us from slipping
- friction between tyres and the road stop cars from skidding
- friction between the brakes and wheel help bikes to slow down

Another example of drag in the real world is in professional cycling. Racing cyclists crouch down low on their bikes to reduce the air resistance on them. This helps them to cycle faster. They also wear streamlined helmets. These have special, smooth shapes that allow the air to flow over the cyclist more easily.