

Box 1: Keywords

Word	Definition
Fluid Mechanics	The study of a body travelling through any liquid or gas, ie. the fluid environment.
Drag Force	Drag force acts in the opposite direction to motion and has a negative effect on velocity.
Surface Drag	Relates to friction between the surface of an object and the fluid environment. Sometimes referred to as skin drag.
Form Drag	Relates to the impact of the fluid environment on an object. Sometimes referred to as shape drag.
Streamlining	Involves shaping a body so it can move as effectively and quickly as possible through its fluid environment.
Lift force	Causes a body to move perpendicular to the direction of travel.
Angle of Attack	The tilt of a projectile relative to the air flow.
Aerofoil	A body with curved surfaces designed to give the most favourable ratio of lift to drag as it moves through its fluid environment.

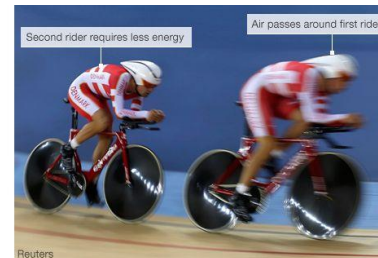
Box 2: Key skills

Calculate biomechanical equations using units of measurement; make observations and draw conclusions from data.

Box 3: Drag Force



Surface Drag – specialised clothing is designed to reduce surface drag, which reduces the friction between the object and its fluid environment. Some garments have been banned by the sport's governing body.



Form Drag – swimmers slip stream, cyclist draft. These provide less turbulent air for the following performer.

Factors that affect Drag

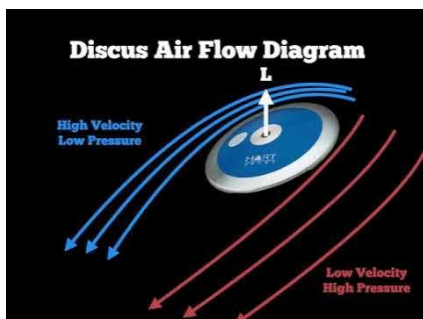
VELOCITY – the greater the velocity, the greater the drag force. Minimising drag to increase speed is an important part of sports performance.

CROSS-SECTIONAL AREA – a larger cross-sectional area increases drag, reducing cross-sectional area is important to reduce the effects of drag.

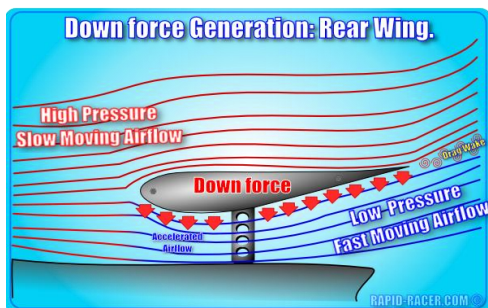
SHAPE AND SURFACE CHARACTERISTICS – smooth, streamline, aerodynamic materials and body shape reduces the effects of drag on the object.

Box 4: The Bernoulli Principle applied to sporting situations

DISCUS AS AN AEROFOIL The discus acts as an aerofoil. If the angle of attack is optimal on release (25-40 degrees), the discus will experience optimal upward lift force and will remain in the air for longer, achieving a greater horizontal displacement.



F1 AND CYCLING AS AN AEROFOIL The spoilers on a F1 car create an inverted aerofoil which creates downward lift force, increasing the friction between the cars tyres and the track to increase speed and performance when cornering. A cyclist will create an inverted aerofoil with their body shape to create a downward lift force to create the same effect and increase friction between their tyres and the road or track surface.

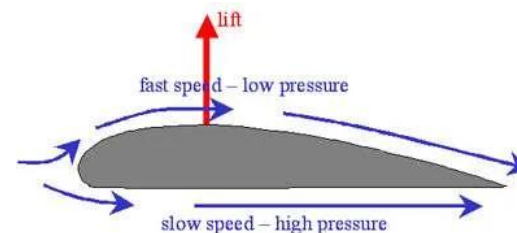


Box 5: Aerofoil and Lift Force

LIFT FORCE Causes a body to move perpendicular to the direction of travel. Lift is achieved when different pressures act on the object.

ANGLE OF ATTACK The tilt of a projectile relative to the air flow.

UPWARD LIFT FORCE When the angle of attack causes air to travel further and faster over the object, causing a lower pressure. And air travels slower under the object causing high pressure, the object experiences an upward lift force.



DOWNWARD LIFT FORCE Inverting the aerofoil will create a downward lift force.

Box 6: Pathway

Previous knowledge: Friction and Projectile Motion

Future links: Synoptic links to Newton's Laws of Linear Motion

Careers: from curriculum narratives

Box 7: Cross curricular links