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Forces and Motion

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FORCE ?

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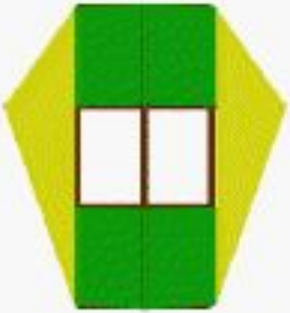
What is it?

Why is it important?

What does it do ?

How does it work?



Examples ?

Forces

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Objects generate forces.

(objects are solid, liquid, or gas)

Forces cause motion.

Forces produce acceleration.

An object's mass resists motion.

(for the same force, heavier object accelerates less)

Forces come in pairs.

Newton's Laws of Motion

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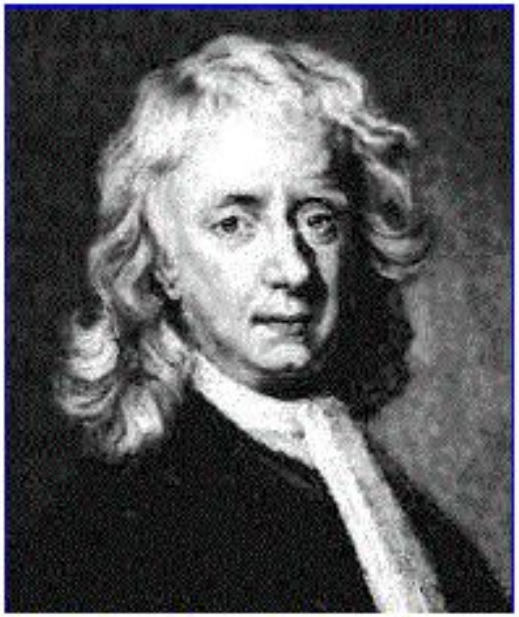

"Every object persists in its state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it."

"Force is equal to the change in momentum (mV) per change in time. (For a constant mass, force equals mass times acceleration . F=m a)"

"For every action, there is an equal and opposite re-action."

Four Forces on an Airplane

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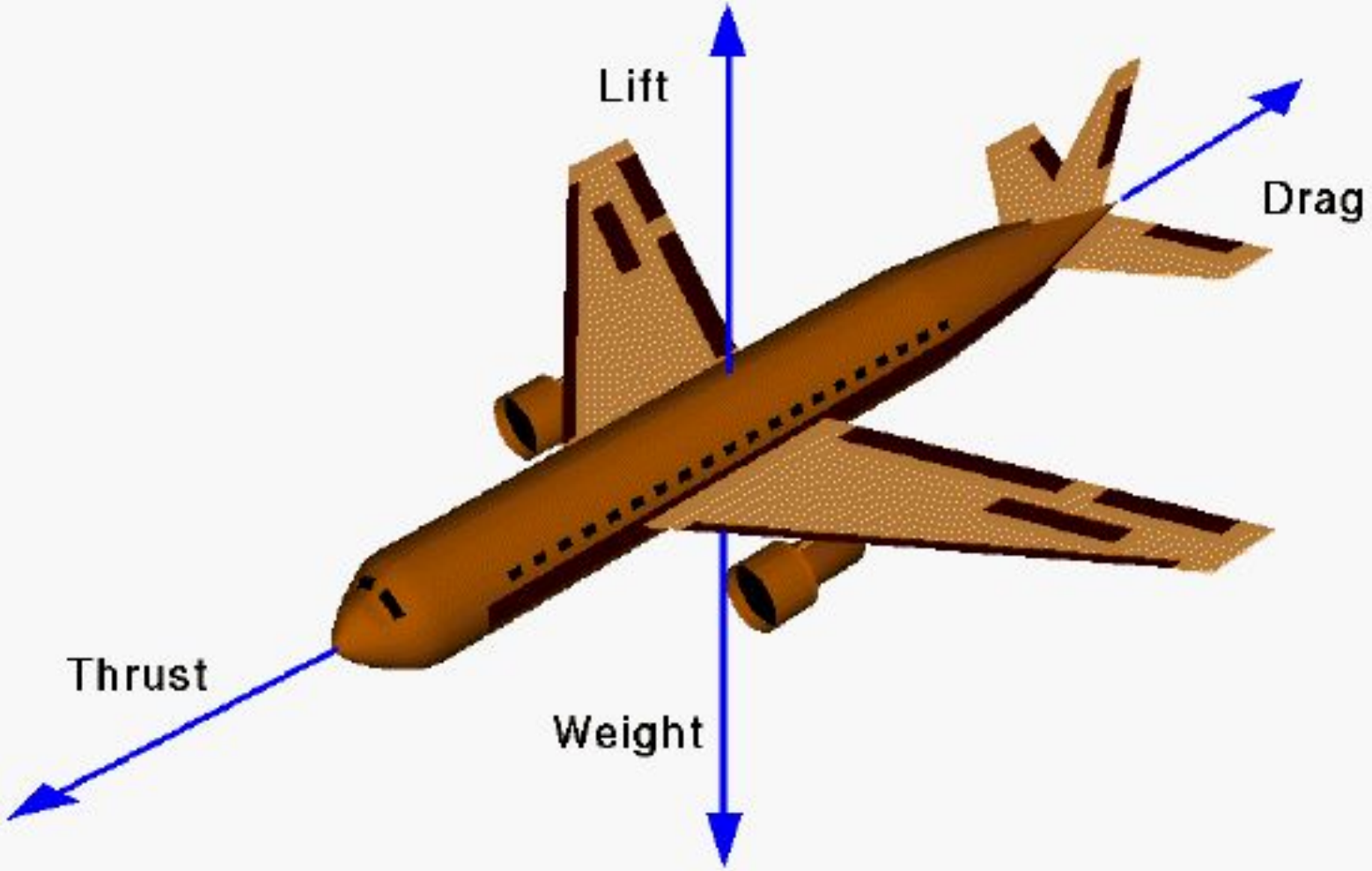

What is Thrust?

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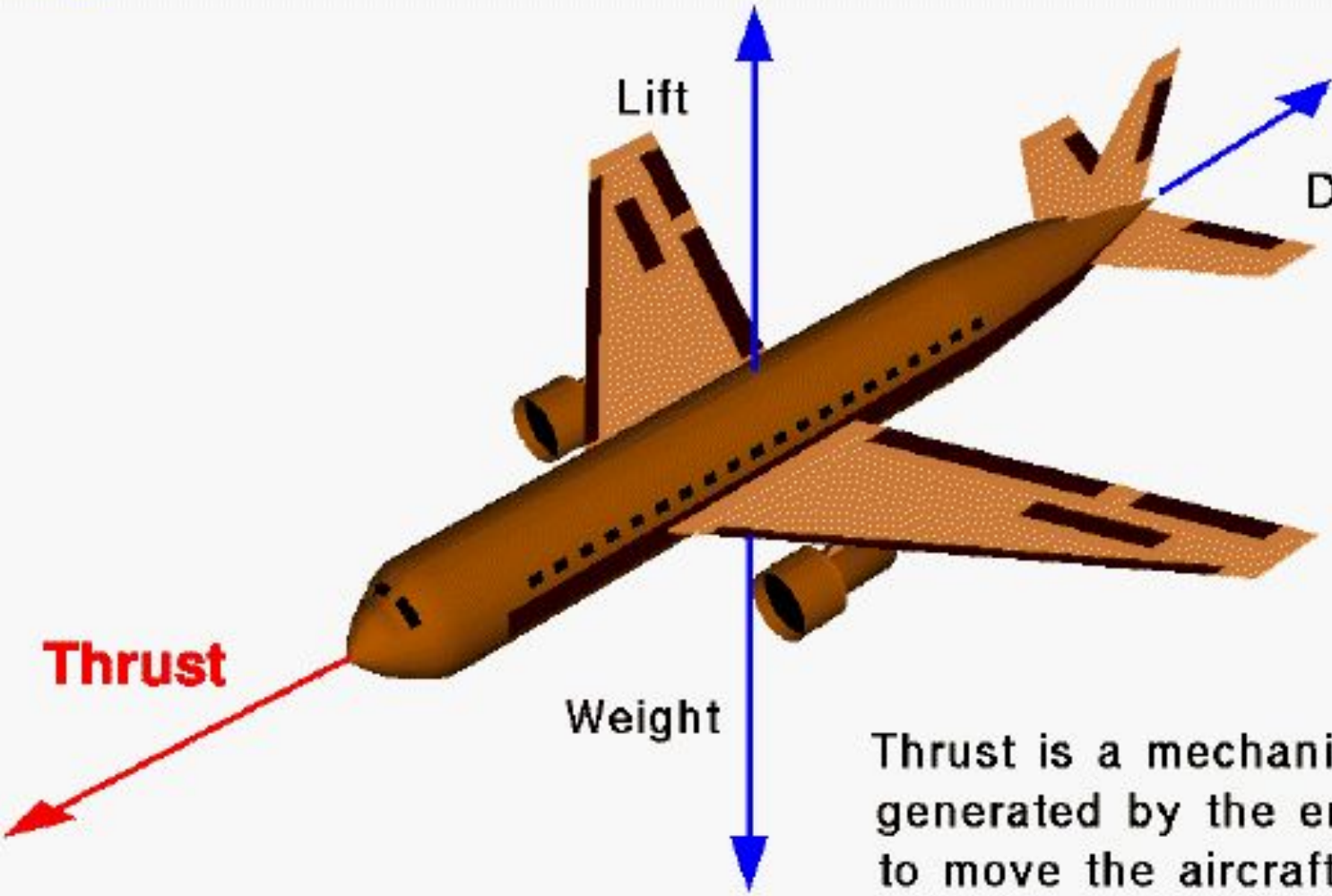

Thrust is a mechanical force generated by the engines to move the aircraft through the air.

What is Lift ?

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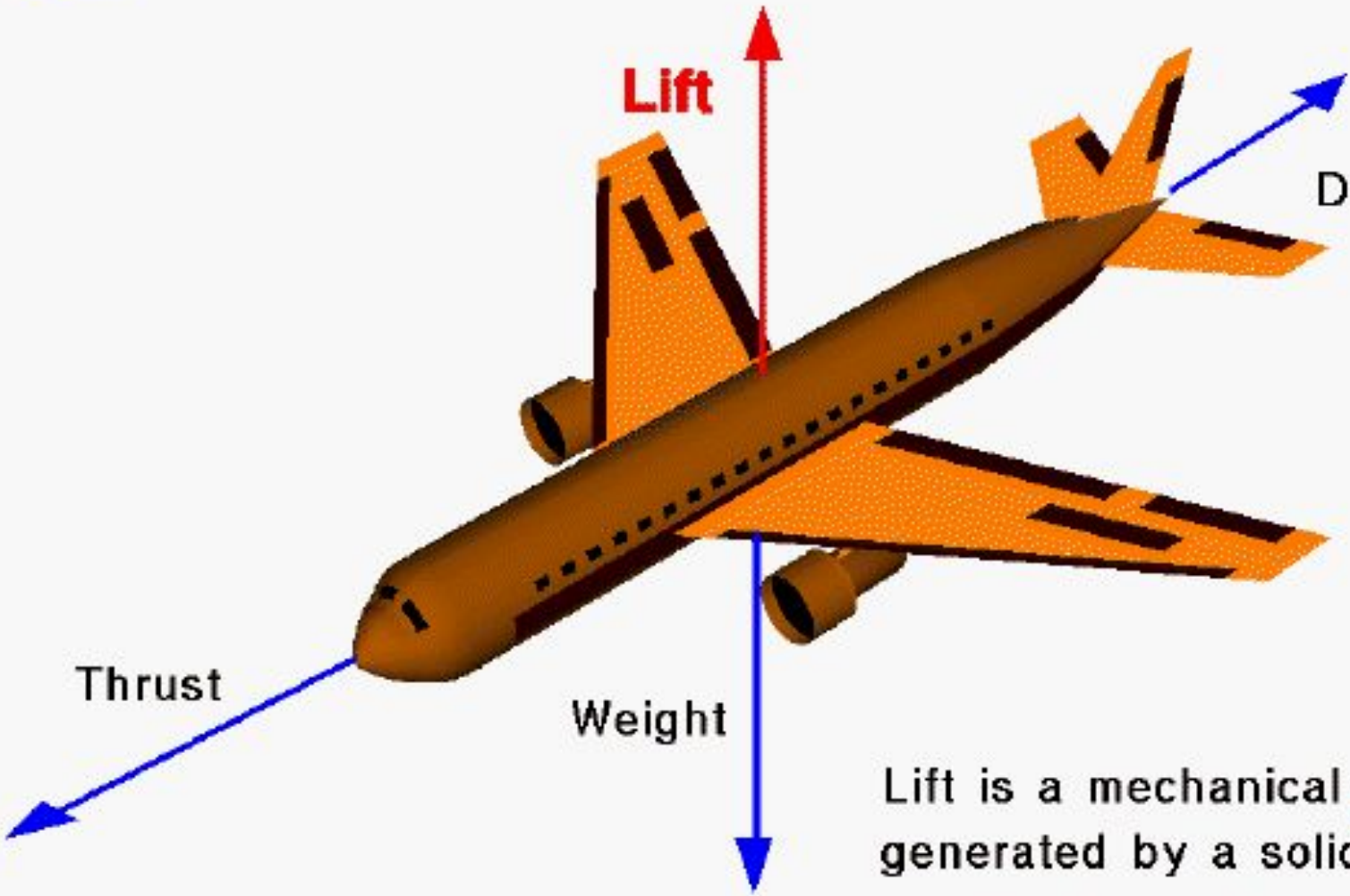
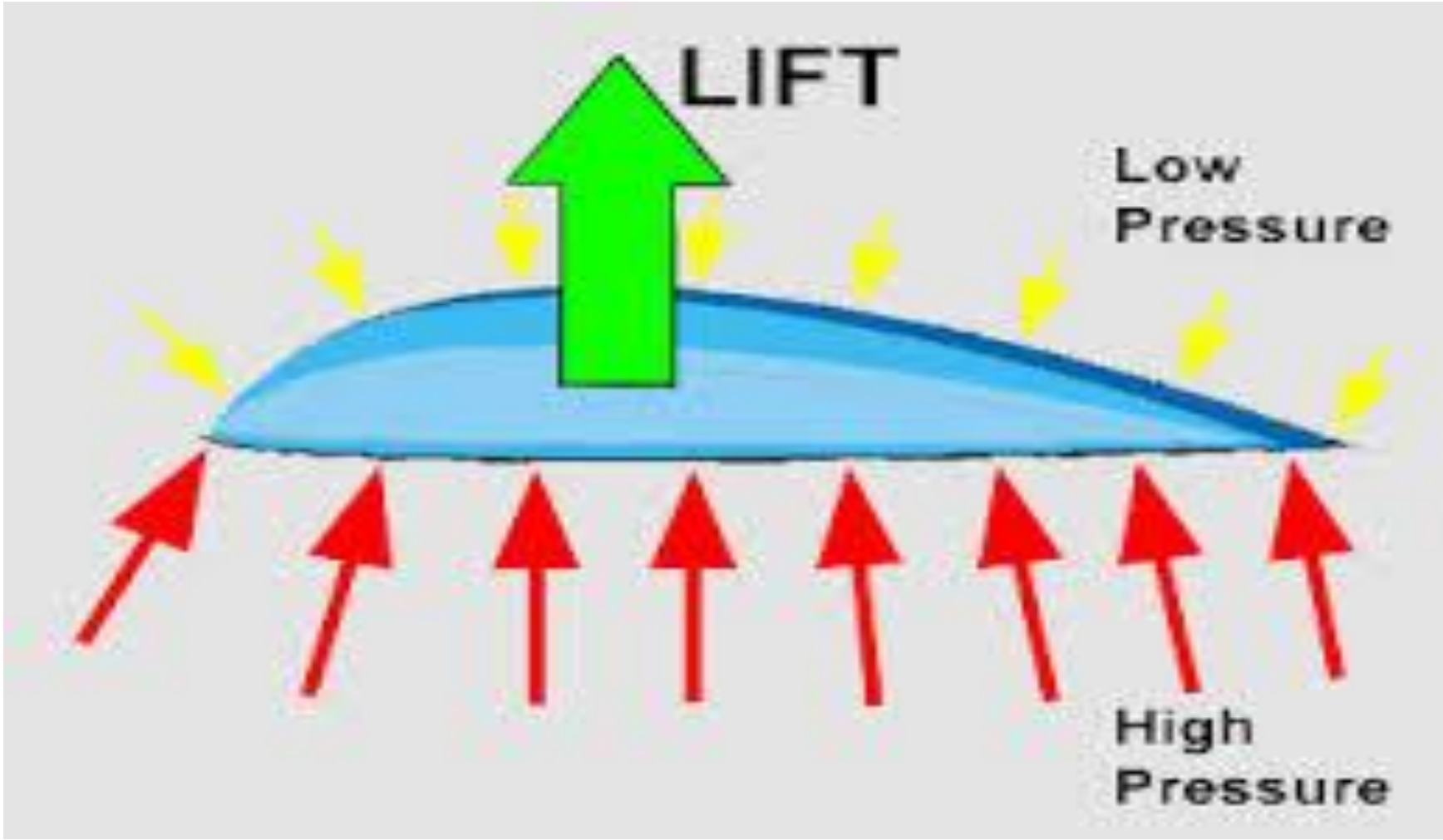


Lift is a mechanical force generated by a solid object moving through a fluid.

Lift



What is Drag?

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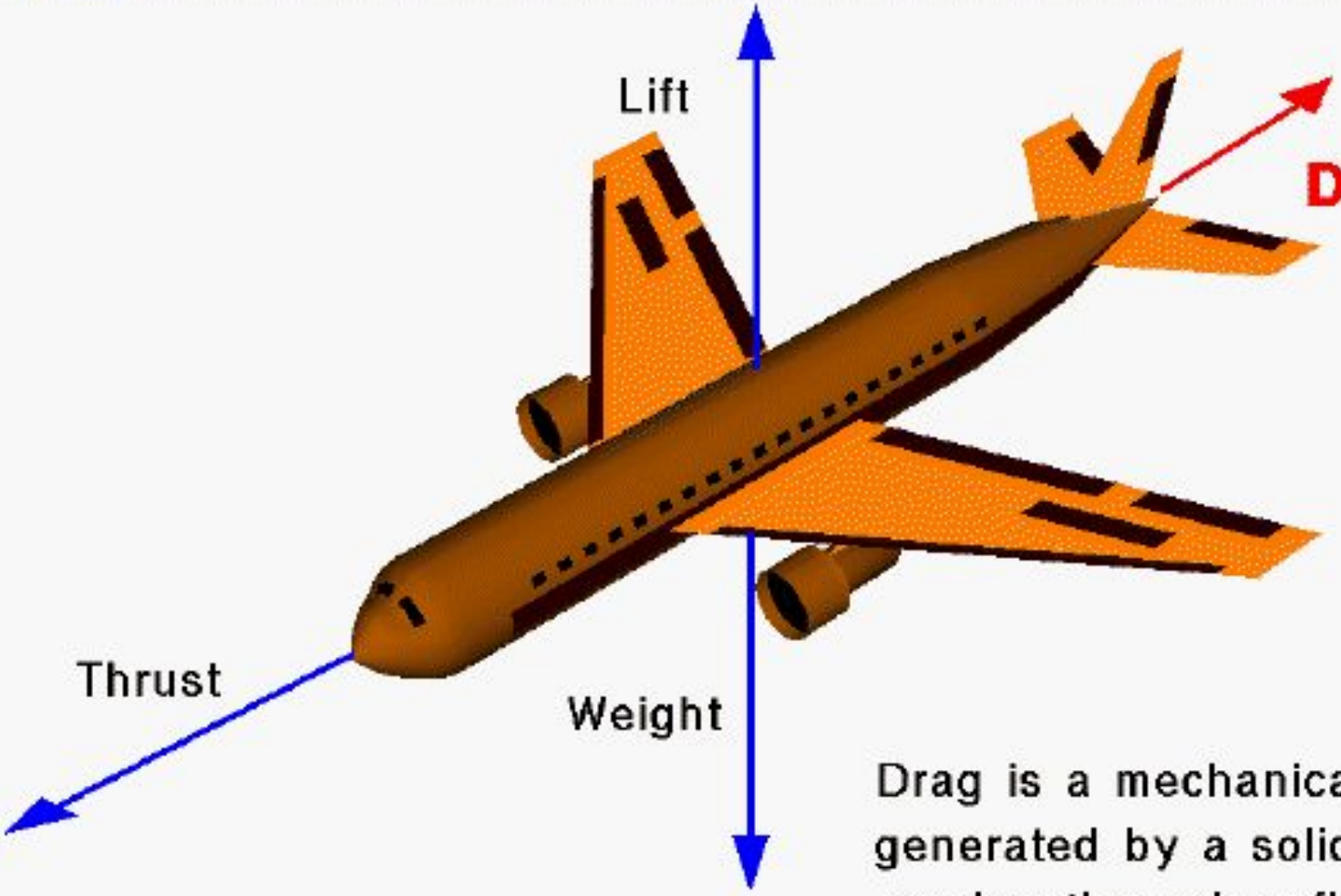

Drag is a mechanical force generated by a solid object moving through a fluid.

What is Weight?

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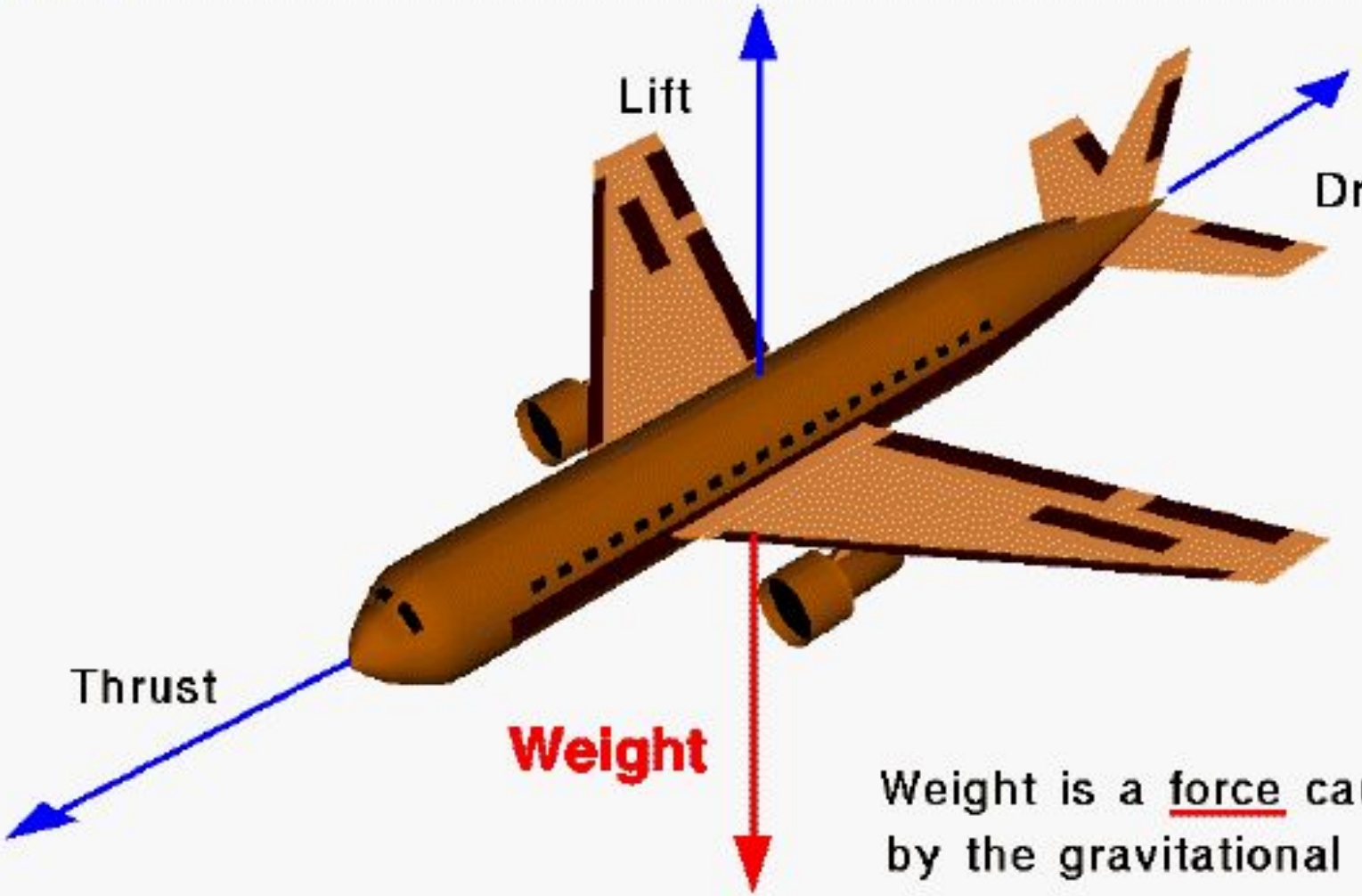

Weight is a force caused by the gravitational attraction of the Earth.

Cruise – Balanced Forces

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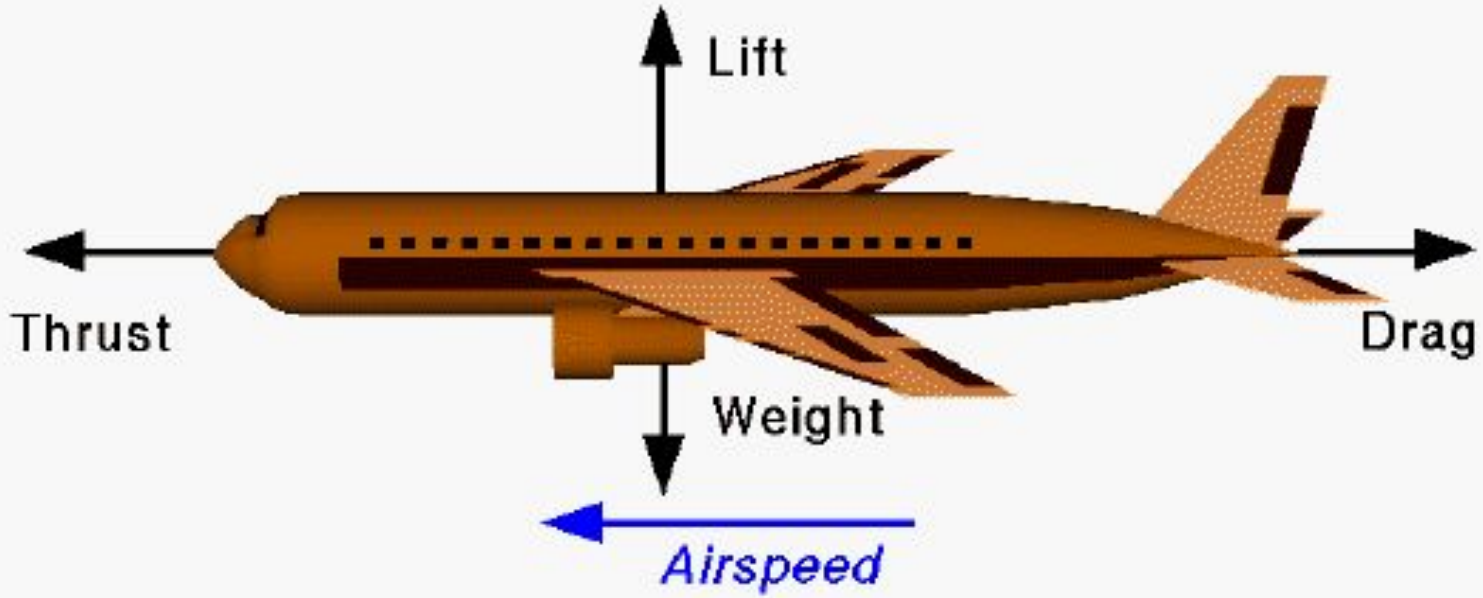

Lift = Weight

Thrust = Drag

Airplane moves in a straight line at constant airspeed.

Simplified Aircraft Motion

Unbalanced Forces

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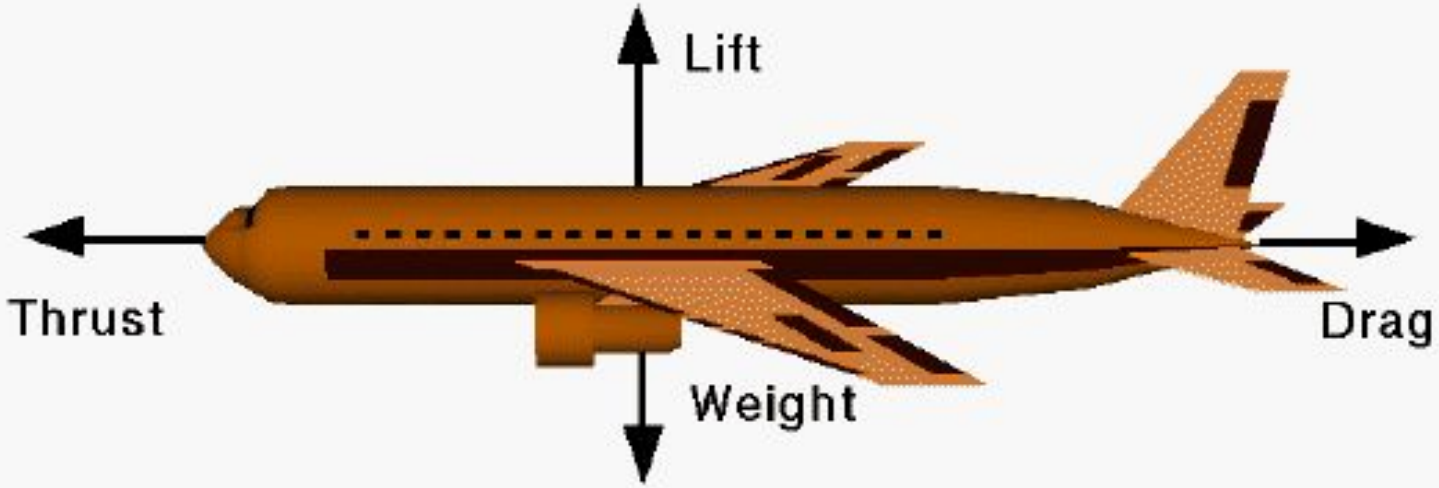

Flight Condition	Effect
Lift > Weight	Plane Rises
Weight > Lift	Plane Falls
Drag > Thrust	Plane Slows
Thrust > Drag	Plane Accelerates

On-Line Educational Resources

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Aerodynamics:

http://www.grc.nasa.gov/WWW/K-12/airplane

Wright Brothers:

http://wright.nasa.gov/

Aero Activities:

http://www.grc.nasa.gov/WWW/K-12/aerores.htm

Help:

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