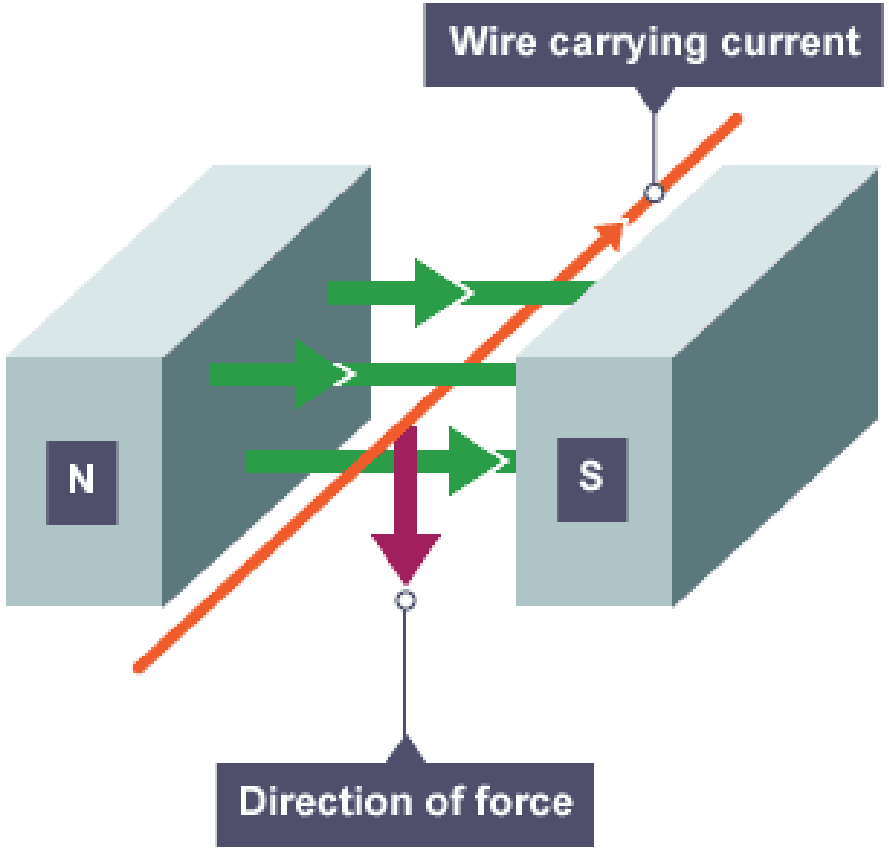
Motor Effect

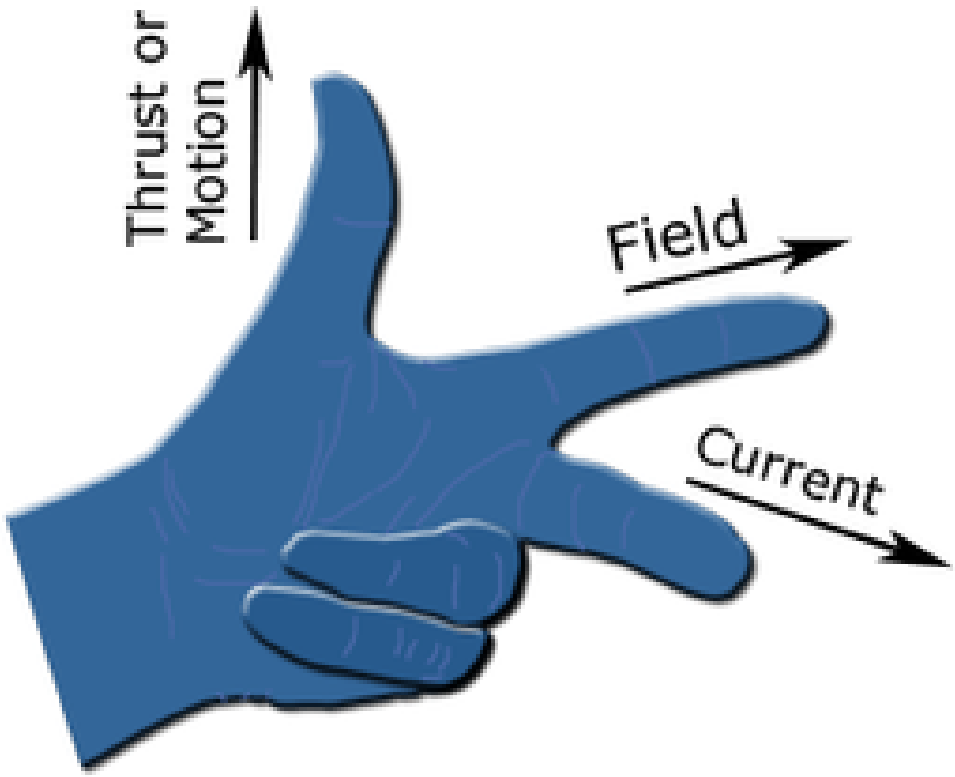
Motor Effect

- If we put a wire with current flowing through it between two magnets the fields that are generated interact
- This moves the wire and the magnets but usually the magnets are stuck in place
- This effect is the motor effect, whenever you see “motor” it means something is going to move



Motor Effect

- We can tell which way the wire will move based on Fleming's left-hand rule
- We know to use the left-hand rule because (Motor cars drive on the left)
- We can remember what finger does what based on this:
  - **Th**rust = **Th**umb
  - **Fi**rst finger = **Fi**eld
  - Se**c**ond finger = **C**urrent



Magnitude of the motor effect

- The magnitude of the force is measured in newtons
- The equation for the magnitude is
  - Force = Magnetic flux density * Current * Length of the wire
  - F = BIL
  - The units are ($NA^{-1}m^{-1}$)
- This equation is only true if the current and the flux density are at right angles to each other

What if they're not entirely perpendicular

- If the current and flux density aren't entirely at a right angle only a component of the force gets generated
- This component can be calculated by multiplying BIL by sinΘ
- Θ is the angle that the wire makes with the field
- At a right angle we have sin(90) which is 1 so it doesn't do anything

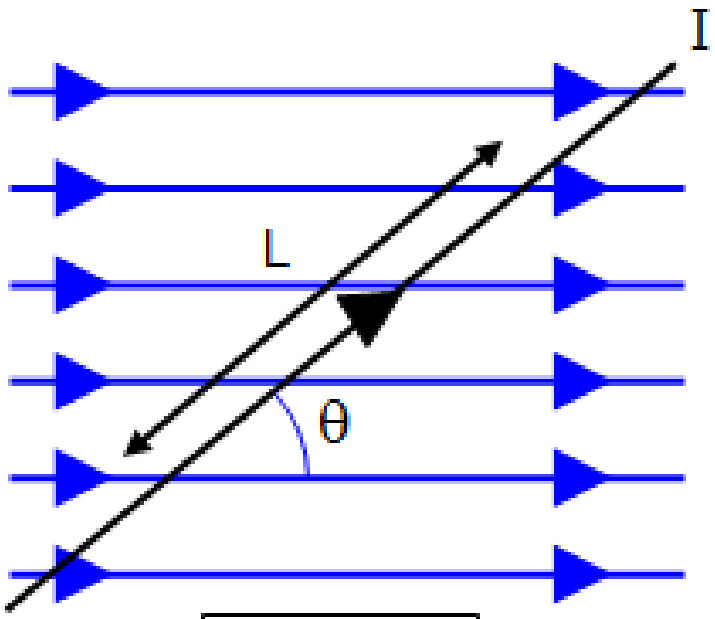


Figure 4

Magnitude of the motor effect

- The equation for when our force is not perpendicular is
- The equation for the magnitude is
  - Force = Magnetic flux density * Current * Length of the wire * sin(angle)
  - $F = BIL * \sin(\theta)$
  - The units are ($NA^{-1}m^{-1}$)