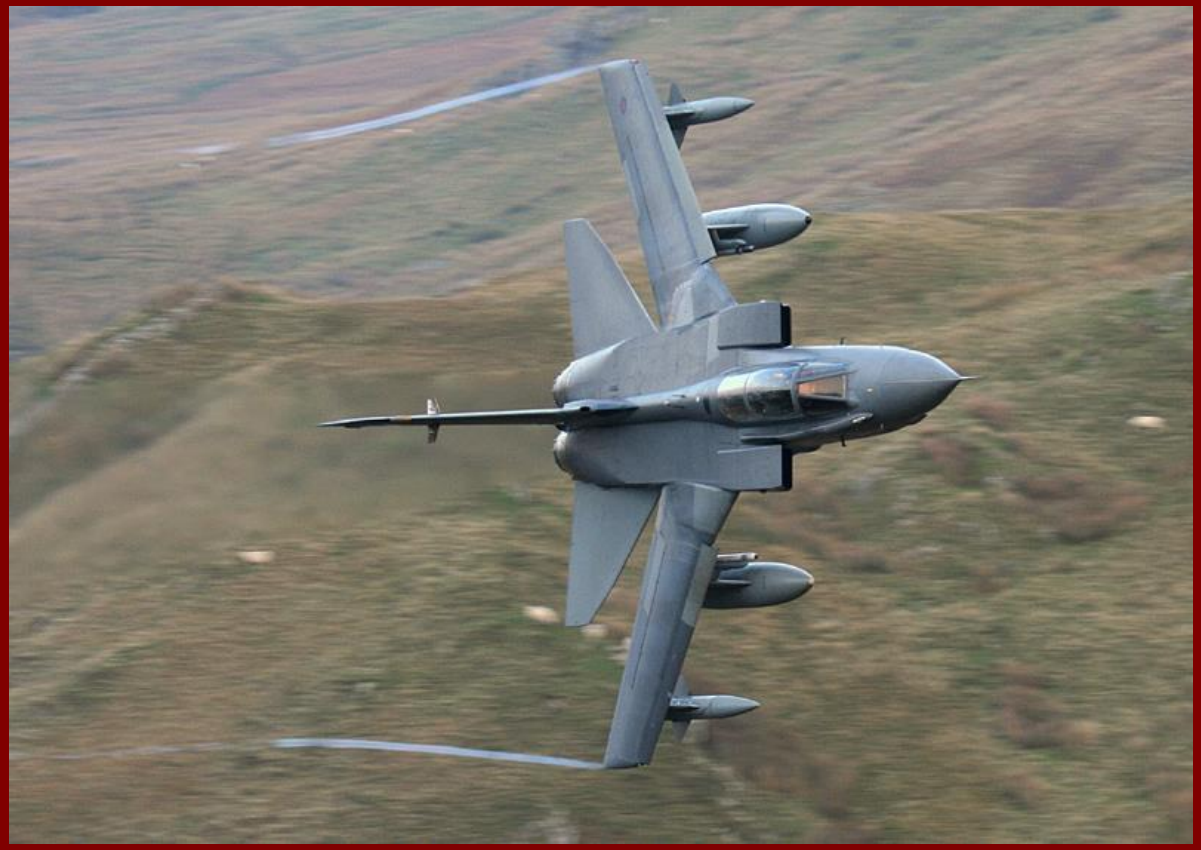
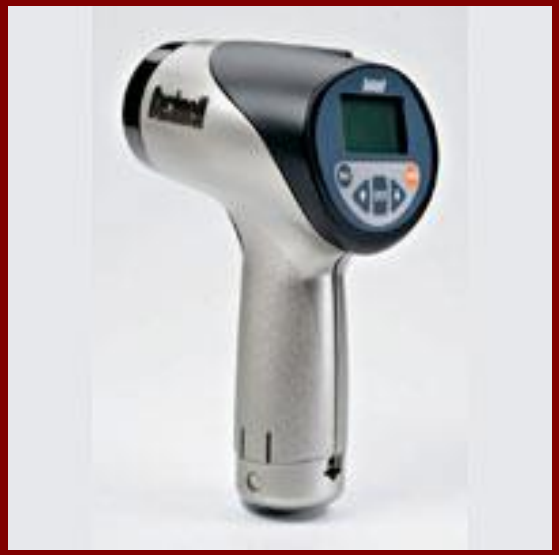
Speed & Velocity



Instantaneous Speed

- Measure of how fast an object is traveling at a given instant

- Example: radar guns, speedometers



Average Speed

- A measure of how fast an object travels over time
  - distance traveled
  - and the time for the trip

Speed = Distance/Time

$$S = \frac{d}{t}$$

Units

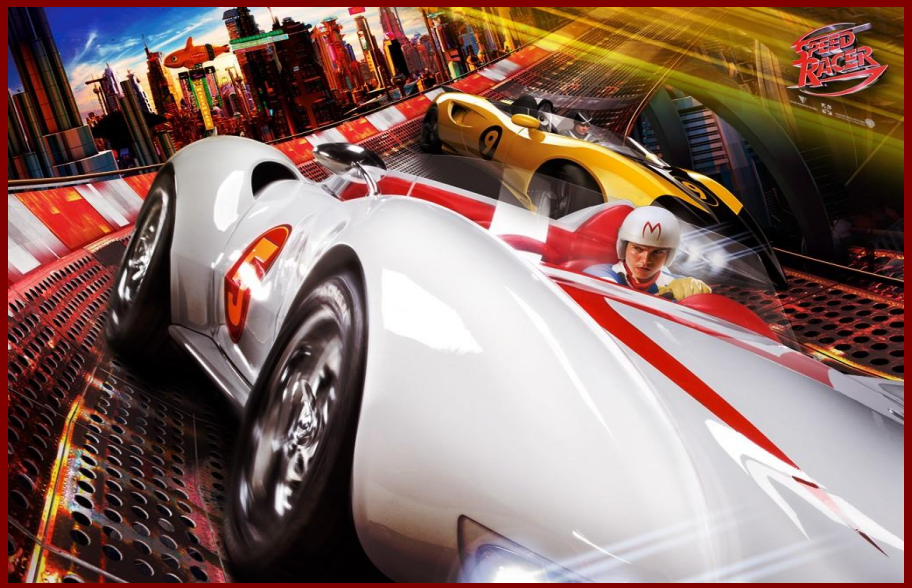
- Units for speed

$$\frac{\text{Distance}}{\text{time}}$$

- Examples: mi/hr m/s

Scalar

- A measure that has magnitude (size) only
- Example: distance (10 m), speed (60 mph), time (5 s)
- Speed is Scalar



Velocity

- A measure of how fast an object is traveling and in which direction it is moving

- Velocity is based on **the displacement of an object**.

$$\bar{v} = \frac{d}{t}$$

Vector

- A measurement that has magnitude and direction
- Example: 29 mph North
- Velocity is Vector

Displacement

- A measure of how far an object is from where it started and in which direction

- Example: 2 meters to left

$\vec{d}$

- displacement is a vector and has direction

Using Signs with Vector Quantities

- Information about direction is given with the signs of the numbers
  - (+) & (-)
  - Example: North is “positive” (+)
    South is “negative” (-)
    right (+) and left (-)