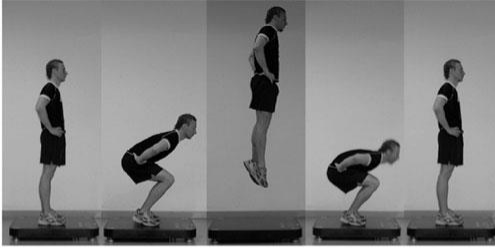
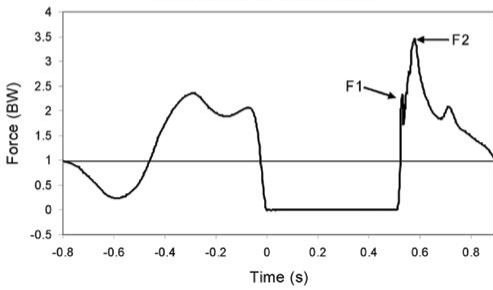


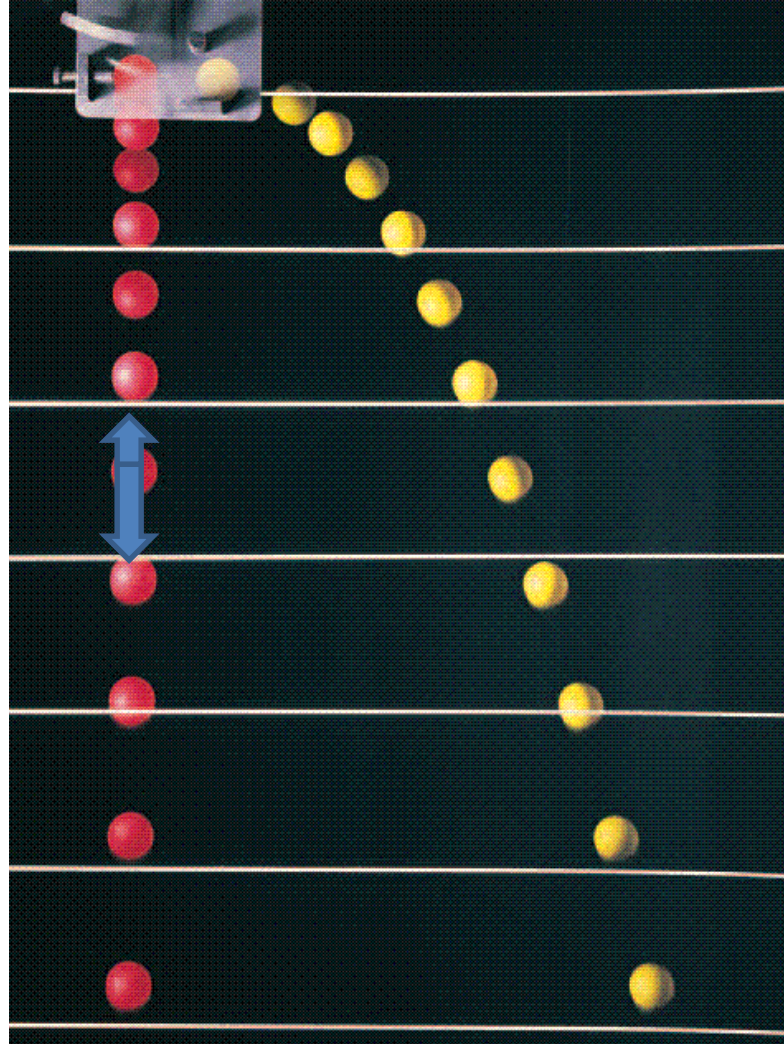
Kinetic Analysis

- Determine what object (system) you are interested in analyzing motion of.
- Identify all the forces acting ON the object (system).
 - Reaction to forces caused BY the system
- Apply Newton's 2nd Law
 - $\sum F_{ON} = ma_{object}$
- Break analysis down to specific directions
- The Kinetics are directly related to the Kinematics
 - Magnitude
 - Direction



GROUND REACTION FORCES





Vertical Motion

-Acceleration = -9.8 m/s/s

-Velocity is constantly changing

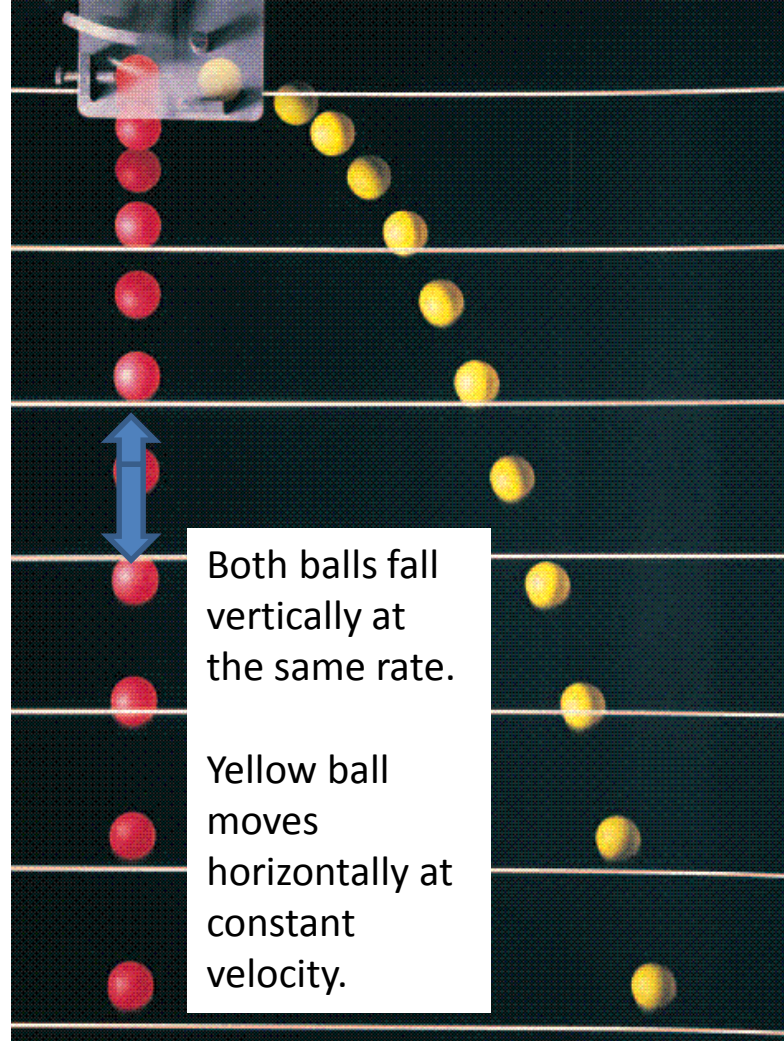
Horizontal Motion

-Acceleration = 0 m/s/s

-Velocity is constant

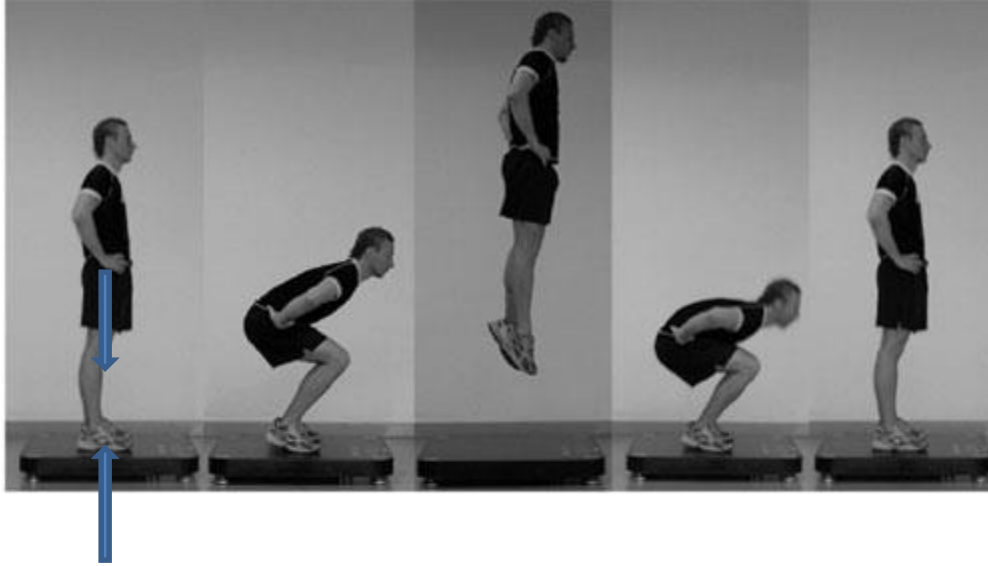
Forces acting on the projectile:

- Gravity
- Air resistance



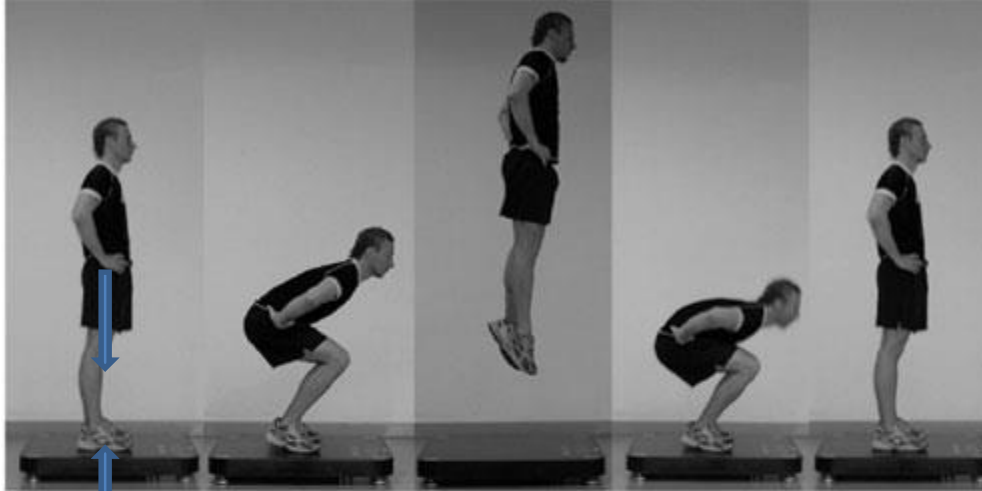
Forces acting on the projectile:

- Gravity
- Air resistance

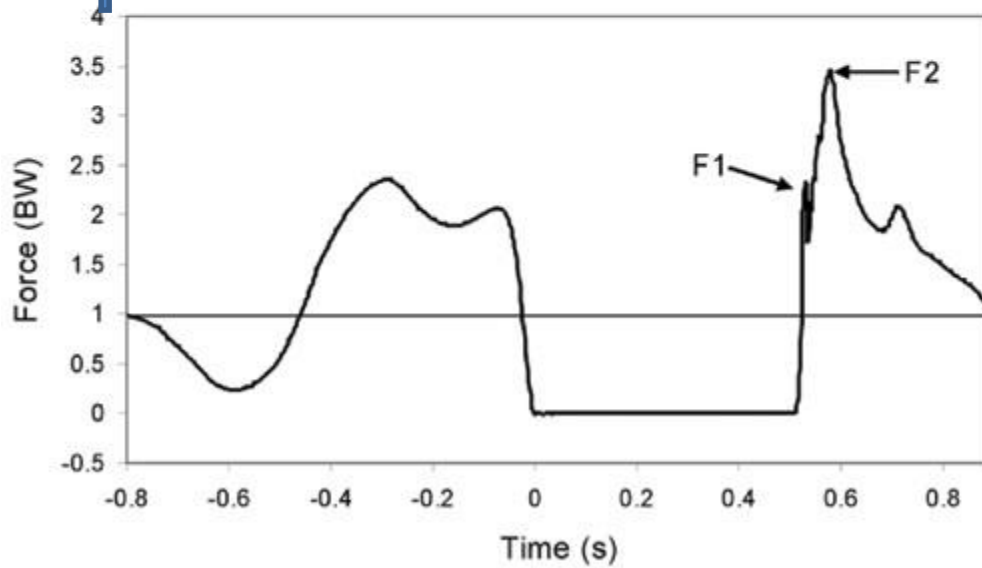


Forces acting on the jumper:

- Gravity
- Ground reaction force
- Air resistance



GROUND REACTION FORCES



Forces acting on the jumper:

- Gravity
- Ground reaction force
- Air resistance



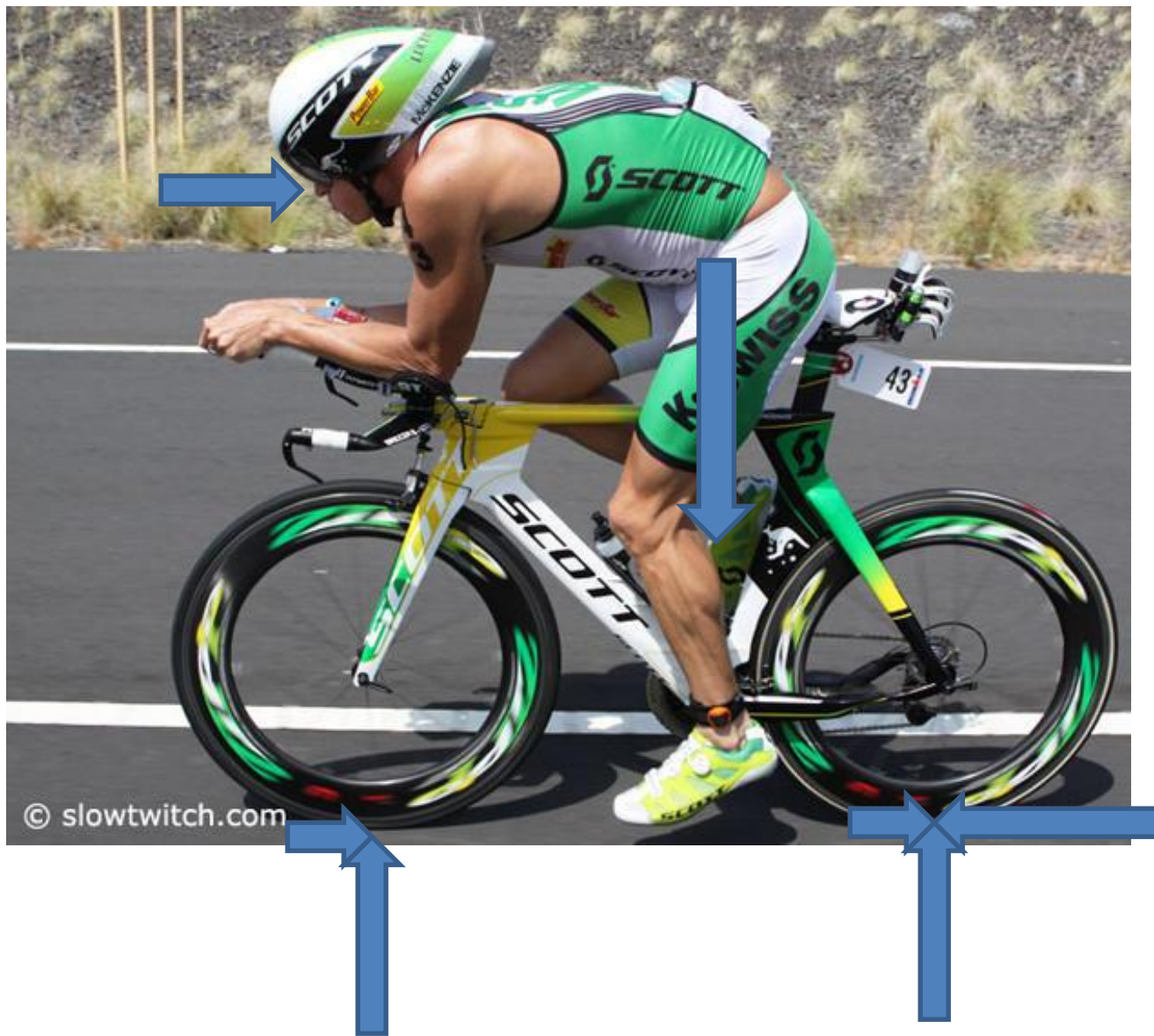
Forces acting on the **runner**:

- Gravity
- Ground reaction force
 - Vertical, anterior-posterior, medial-lateral
- Air resistance



Forces acting on the **bike/rider** system:

- Gravity
- Ground reaction force (each wheel)
- Air resistance
- Propulsive force



Propulsive force must match resistance force to maintain horizontal velocity.
- reduce resistance force



Forces acting on the **rider**:

- Gravity
- Seat reaction force
- Hand/Elbow
- Air resistance
- Pedal force (each foot)

Force component 'parallel' to the ground.



Force component 'normal' to the ground.

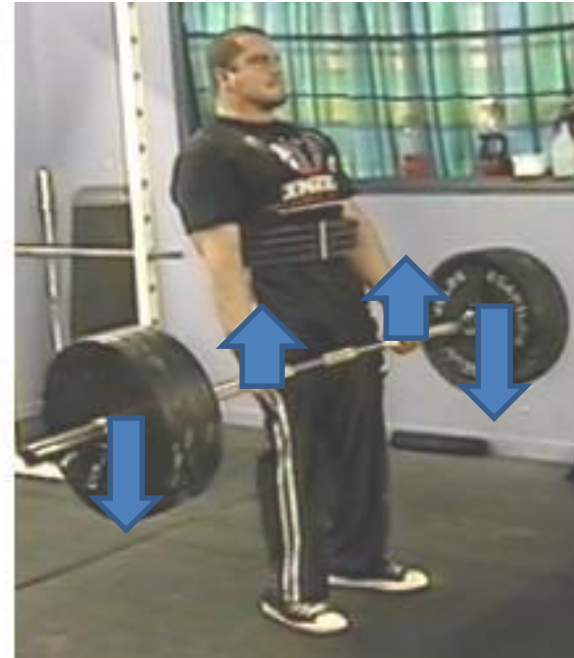
- Riding uphill ... Gravity (vertical force) has a component opposing direction of motion.
- Reduce bike/rider weight





Forces acting on the **lifter/weight system**:

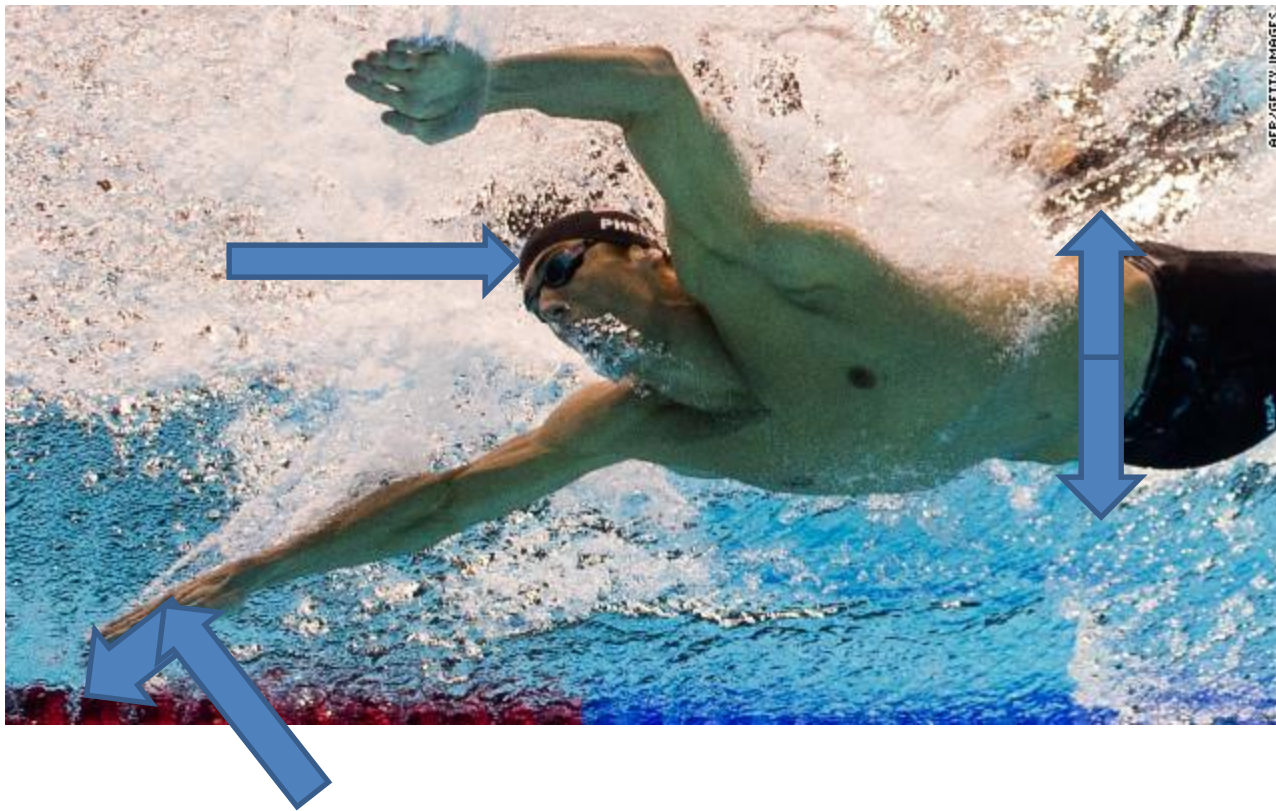
- Gravity
- Ground reaction force



Forces acting on the **weight**:

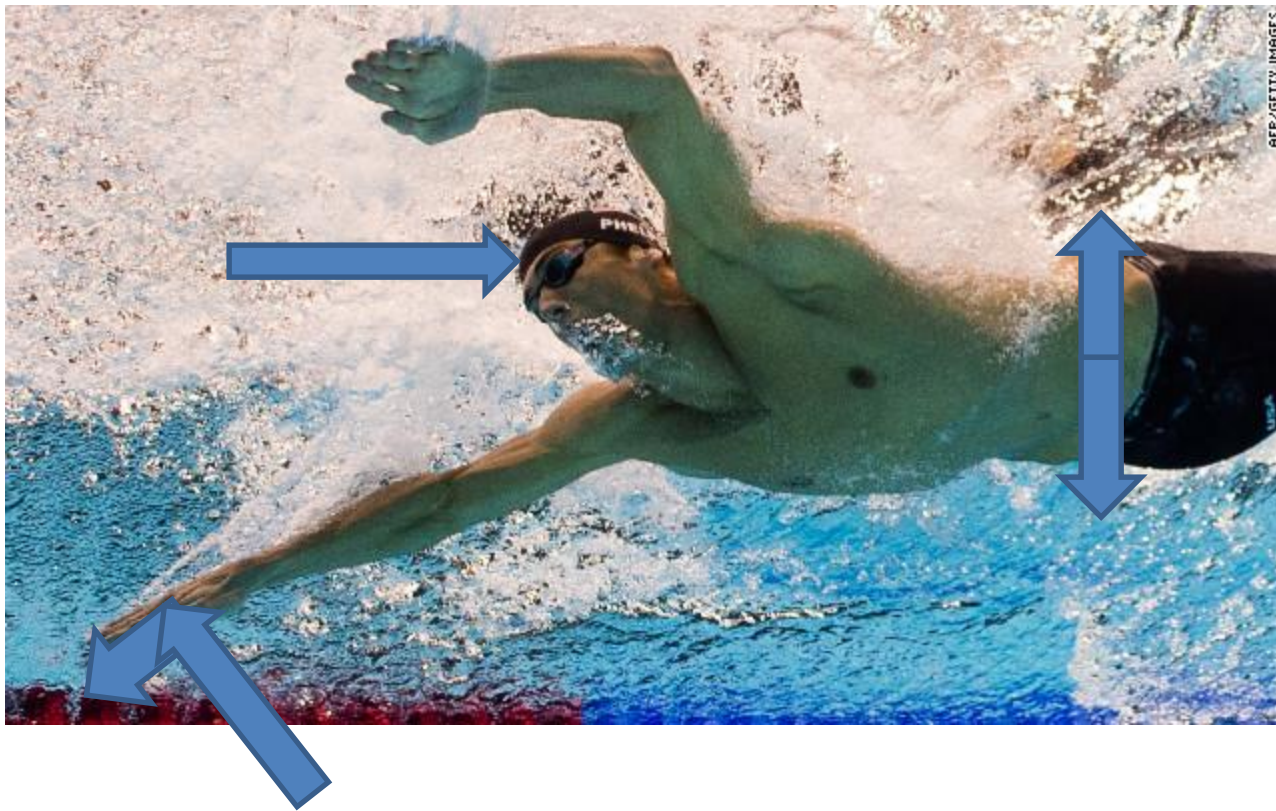
- Gravity
- Hands





Forces acting on the swimmer:

- Gravity
- Buoyancy
- Drag (hands / legs)
- Lift
- Water resistance



Reduce resistance force.

- Swim suit, goggles, cap, skin
- position

Maximize propulsive force.

- drag



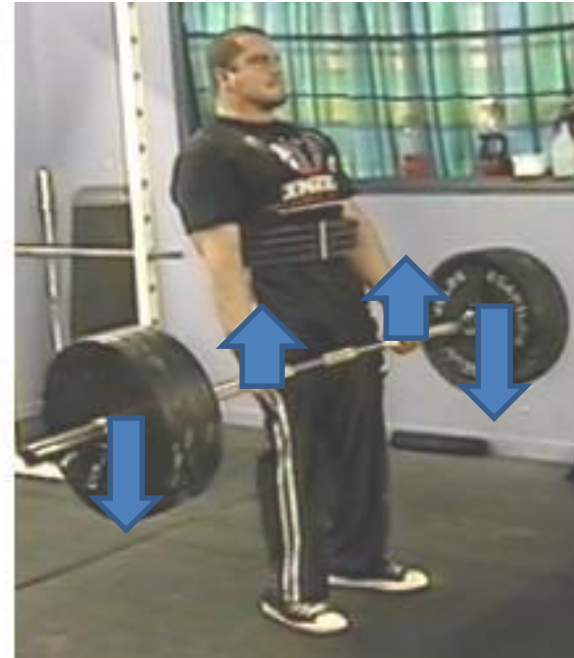






Forces acting on the **lifter/weight system**:

- Gravity
- Ground reaction force



Forces acting on the **weight**:

- Gravity
- Hands



Kinetic Analysis

- Determine what object (system) you are interested in analyzing motion of.
- Identify all the forces acting ON the object (system).
 - Reaction to forces caused BY the object (system)
- Apply Newton's 2nd Law
 - $\sum F_{ON} = ma_{object}$
- Break analysis down to specific directions
 - e.g., horizontal, vertical, medial-lateral
 - If I am interested in horizontal motion, I need to identify all the horizontal forces acting on the system.
 - Sometimes, you need to break a 3D force into components.
- The Kinetics are directly related to the Kinematics
 - Magnitude
 - Direction