

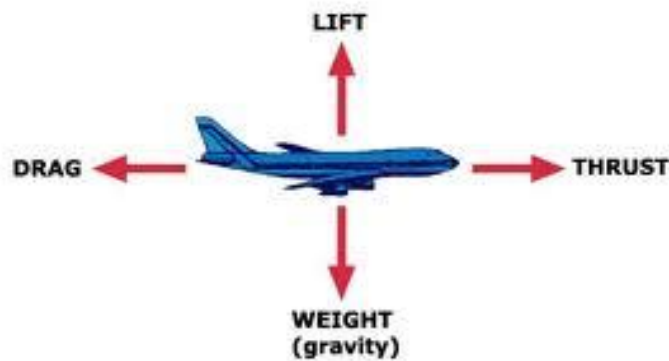
Science Soars

CSTA Presentation
2 October 2015

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1. Forces of Flight

- a. "Weight": gravity acting on mass of aircraft
- b. Lift: upward force created by wings, rotors, engine or buoyant gas
- c. Drag: friction of air resistance (and lift) that resists forward motion
- d. Thrust: force propelling aircraft forward, usually from engine



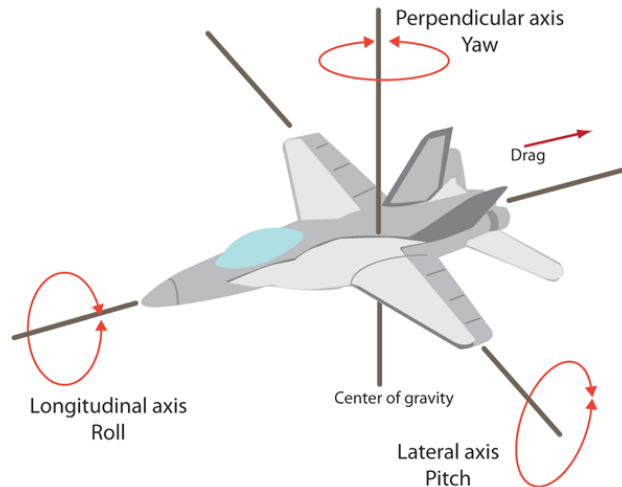
2. Types of Aircraft (Source of Lift)

- a. Airplanes (Wing)
- b. Gliders (Wing)
- c. Helicopters (Rotor)
- d. Lighter Than Air (Buoyant Gas)
- e. Powered Lift (Engine)

3. Investigating the Four Forces

- a. Glider Construction
- b. Wing Modification
- c. Flight Tests

4. Three Axes of Control (Control Name)
 - a. Roll (Ailerons): dipping wings left and right
 - b. Pitch (Elevators): tipping nose up and down
 - c. Yaw (Rudder): sliding nose left and right
 - d. Explorations with Post-It-Notes



5. Activities
 - a. Gliders
 - i. Forces of Flight
 - ii. Flight Control w/Post-It Notes
 - b. Helicopters
 - i. Paper Helicopters
 - ii. Puddle Jumpers
 - iii. Balloon Helicopters
6. Resources
 - a. Gliders/Airplanes
 - i. Wooden Gliders: Paul K. Guillows (Eagle or Sky Streak)
 - ii. Mini Glider: Hiller Aviation Museum
 - iii. Paper Gliders: Oriental Trading, Rhode Island Novelty, US Toy
 - b. Helicopters
 - i. Free Paper Helicopter Pattern: <http://quest.nasa.gov/space/teachers/rockets/act11ws2.html>
 - ii. Inexpensive Puddle Jumpers: Oriental Trading Flying Dragonfly (IN-16/164), \$4/dz. NOTE: may require clay at bottom of shaft to balance properly.
 - iii. Balloon Helicopters: Rhode Island Novelty (intermittent), Steve Spangler Science (expensive). Should be \$0.50/each.