RHV – Cessna 172
Agenda

• **Physics** – How can a plane stay up and move?

• **Movement Vectors** – How many dimensions can we change and move?

• **Control Surfaces** – How do we change directions up and down, left and right? Note that we are inside a metal box we like to move. Thanks to the aeronautical engineers!

• **Basic Flight Maneuvers** – What do pilots do from point A to point B?
Physics
The Four Forces

- Thrust
- Lift
- Gravity
- Drag
The Four Forces Explained

- **Gravity** – The earth exerts this natural force on all objects.
- **Lift** – To keep the airplane up; lift occurs because air flows both over and under the surface of the wing. The design of the wing makes the air moves faster on the top and thus the lift.
- **Thrust** – It is created by the engines. The propeller blades push air through the engine, the aircraft moves forward.
- **Drag** – This opposes thrust. This can come from skin friction, secondary result of lift, or induced drag.
Diagram of Lift

air flows at different speeds
Movement Vectors

• Pitch
  • up and down
• Yaw
  • turn to left and right
• Roll
  • down to left and right
Pitch

The elevators control the pitch. To pitch down, push the stick forward.
The yaw is controlled by the rudder. To yaw to the left, move the stick to the left.
The ailerons control the roll. Move the stick to the left to roll to the left.
Control Surfaces
Control Surfaces Explained

• Elevators
  • on the tailplane to control the pitch

• Rudders
  • vertical component of the tail assembly to control the yaw

• Ailerons
  • on the outer trailing edges of the wing to set up the rolls

• Flaps
  • on the inner trailing edges of the wing to change the angle of attack and thus the lift
Basic Flight Maneuvers

• Take off
  • ground to air, speed control and directional control
• Climbing
  • gain altitude with maximum clearance or distance
• Descending/Diving
  • reduce altitude by reducing throttle setting or pitching down the nose
• Landing
  • air to ground, smooth transitions in throttle and pitch
• Banked Turns
  • roll to set up the bank and pitch to maintain altitude
Concluding Remarks

• We covered
  • Physics
  • Movement Vectors
  • Control Surfaces
  • Basic Flight Maneuvers

• Take a closer look next time you fly
  • in and around the airport
  • in and around the airplane
  • out of the window
View Outside of Your Window