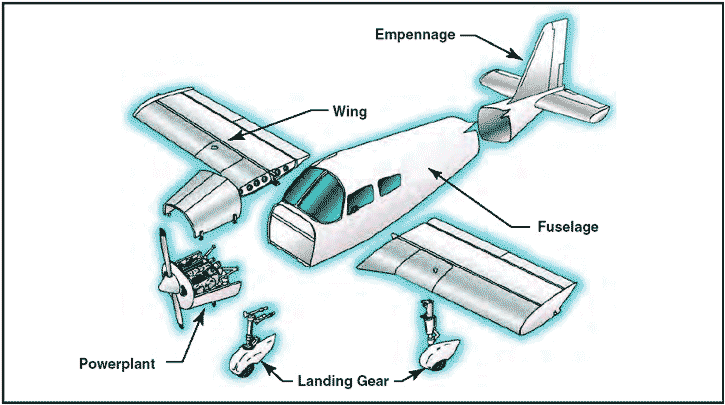
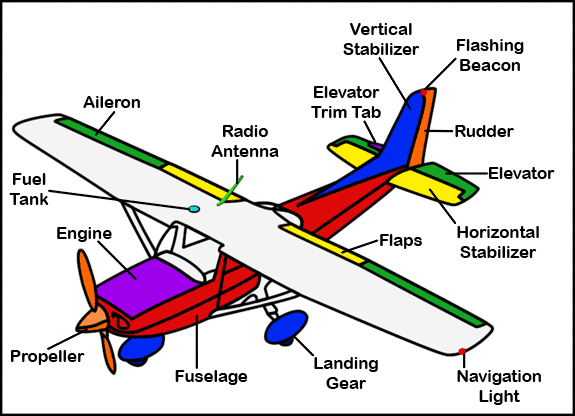
Lesson 1

Aircraft Design and Construction

1. Parts of an Airplane
   1. The airplane is defined as:
      1. A power-driven heavier-than air aircraft deriving its lift in flight from aerodynamic reactions on surfaces that remain fixed under given conditions of flight.
   2. Airplanes are complex structures with many parts.



* 1. Fuselage
     1. Main body of the aircraft, where the passengers, cargo, and crew go.
     2. Different types of construction:
        1. Truss type
           1. Longerons
           2. Diagonal web members
           3. Vertical web members
        2. Monocoque
           1. Skin only
        3. Semi-monocoque
           1. Stringers
           2. Formers and/or bulkheads
           3. Stressed skin
  2. Empennage
     1. Rear portion of the airplane
     2. Integral to control and stability during flight
        1. Vertical Stabilizer
           1. Rudder

Trim Tab

* + - 1. Horizontal Stabilizer
         1. Elevator

Trim Tab

* 1. Wing
     1. Spars
        1. Main structural member
        2. Carry loads
     2. Ribs
        1. Web or truss
        2. Support skin and give shape
     3. Leading and Trailing Edges
     4. Wires
        1. Further structural support
     5. Covering
        1. Metal or Fabric
           1. Weight vs strength trade-offs

1. Aircraft Construction
   1. High wing
      1. Gravity feed fuel system
      2. Increased downwards visibility
      3. Increased lateral (roll) stability
   2. Mid Wing
   3. Low Wing
   4. Bi-Plane
2. Landing Gear
   1. Types
      1. Conventional (Tail-dragger)
         1. Two main wheels and a tail wheel
      2. Tricycle
         1. Two main wheels and a nose wheel
            1. Advantage in while manoeuvring
            2. Advantage in forward visibility on the ground
      3. Retractable
         1. Wheels move into the fuselage when airborne to reduce drag and increase cruise speed
         2. Increased weight, complexity, and potential for failure are trade-offs
      4. Fixed
         1. Do not retract
      5. Floats
         1. Fixed to allow water landings
      6. Amphibious
         1. Floats with retractable wheels to allow for ground landings as well
      7. Skis
         1. Fixed to allow landing on snow
         2. Some designs also allow for wheeled landings
   2. Shock Absorption
      1. Spring steel landing gear
      2. Air/Oil Oleos
      3. Rubber cords or discs
      4. Low pressure tires
   3. Brakes
      1. Used for slowing down, as well as steering
3. Standard Terminology
   1. Wing Span
      1. The maximum distance from wing tip to wing tip
   2. Chord
      1. The imaginary line between the leading edge and trailing edge of the wing
      2. Because it is rarely constant throughout the wing, Mean Aerodynamic Chord is measured as an average
   3. Wing Area
      1. Length of the wing multiplied by the mean aerodynamic chord
   4. Planform
      1. Shape of the wing as seen from above
      2. Different standard patterns exist
   5. Aspect ratio
      1. Ratio of the span to chord of the wing
      2. A measure of how slender the wing is
   6. Airfoil
      1. A structure curved to produce lift
   7. Camber
      1. A measure of the curvature of an airfoil
   8. Angle of Incidence
      1. Angle between chord line and the longitudinal axis
   9. Relative Airflow
      1. Airflow over the wing
      2. Related to the forward motion of the aircraft through the air
   10. Angle of Attack
       1. Angle between chord line and relative airflow