Jet Aircrafts

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Polish Air Force Academy in Dęblin

Categories of Aircraft

Aircraft

vehicle which is able to fly by being supported by the air

Aerodyne - Heavier than air

uses dynamic movement through the air to produce lift

Powered aircraft

uses engine thrust

Powered fixed-wing - airplane, aeroplane or plane

forward motion generates lift as the wing moves through the air

Jet aircraft

an aircraft propelled by jet engines

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Aerodynamic forces

Lift

lift is the upward force

Drag

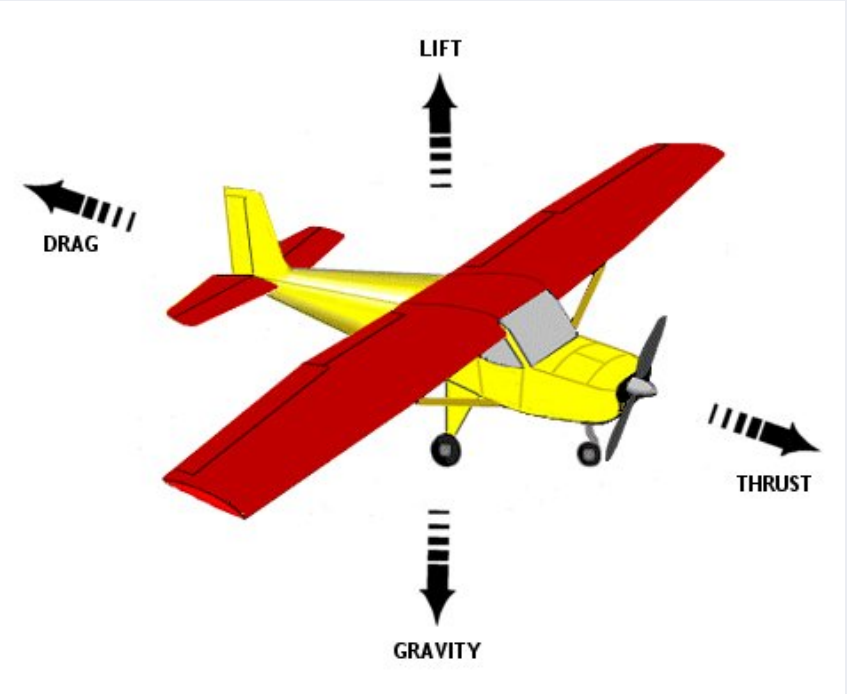
drag is the resistance of air (the backward force)

Thrust

thrust is the power of the airplane's engine (the forward force)

Gravity (or weight)

gravity is the downward force



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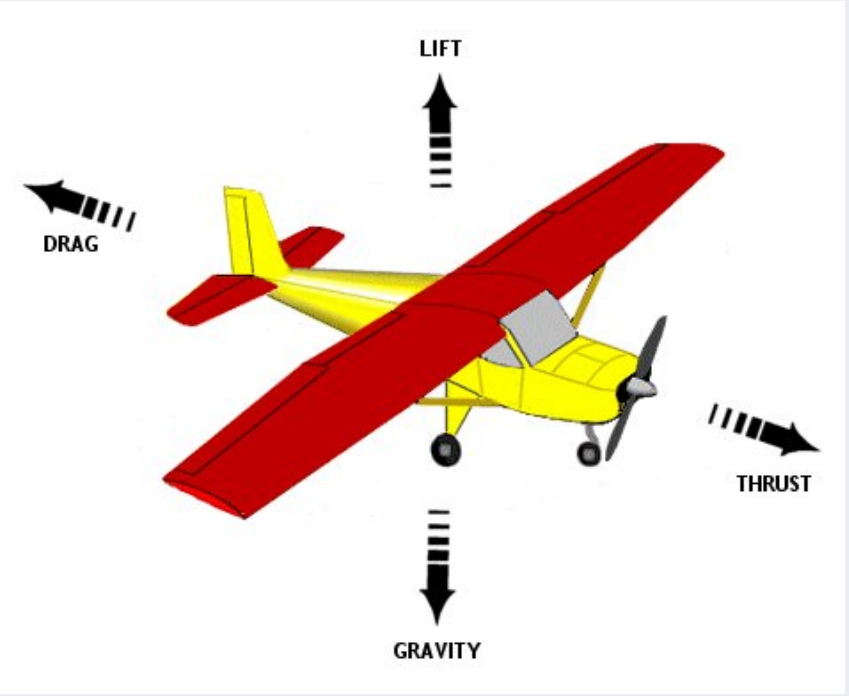

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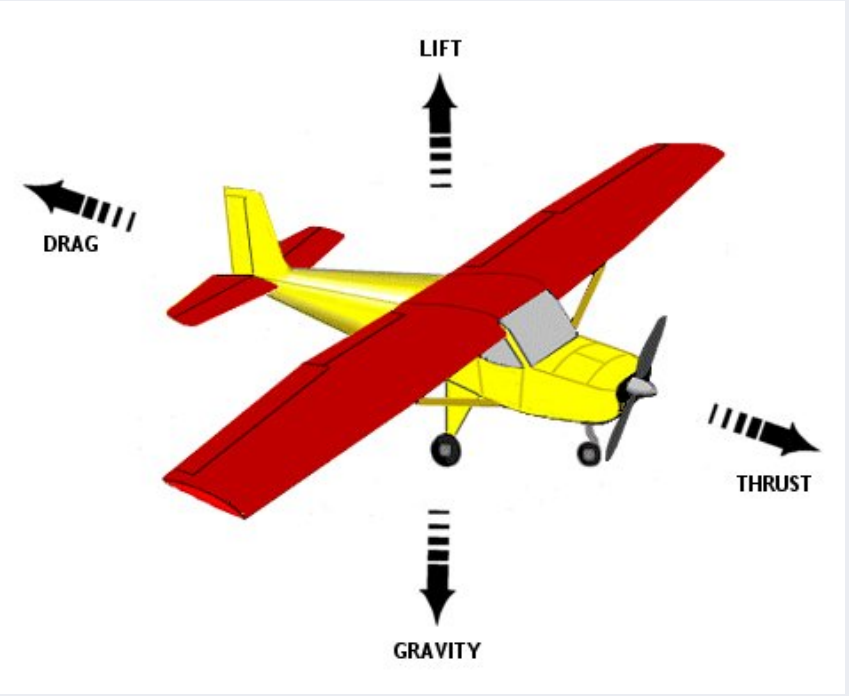

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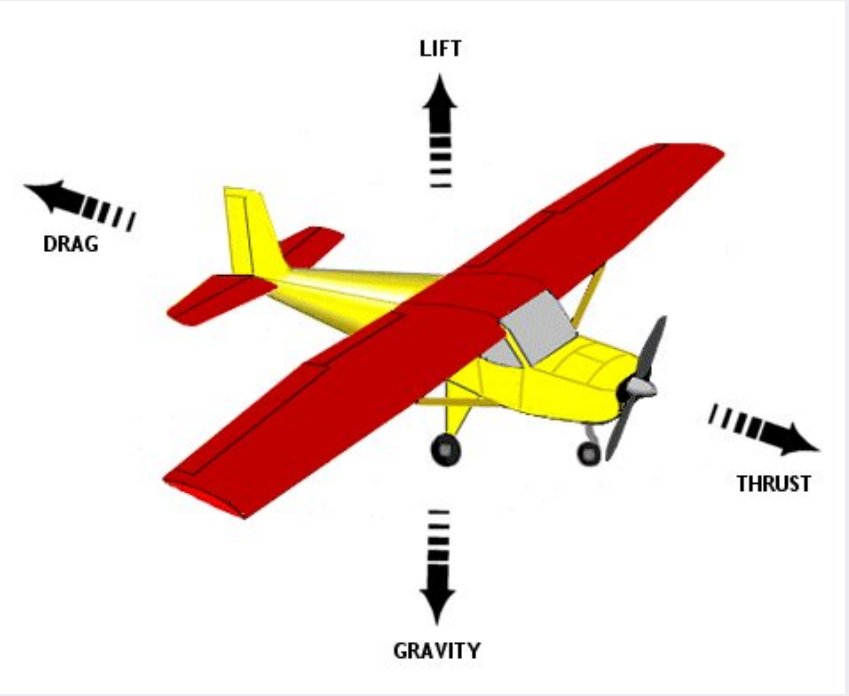

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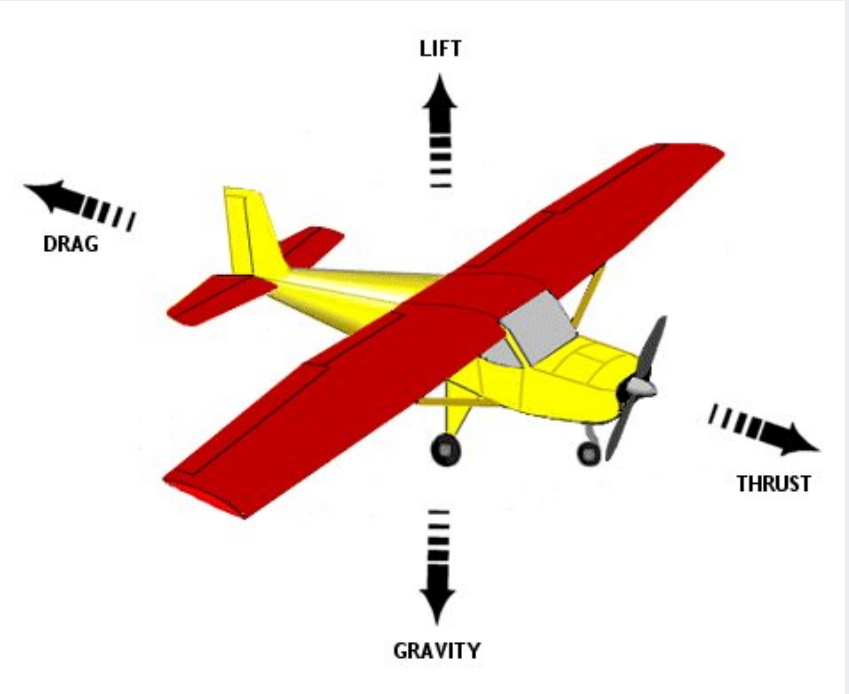

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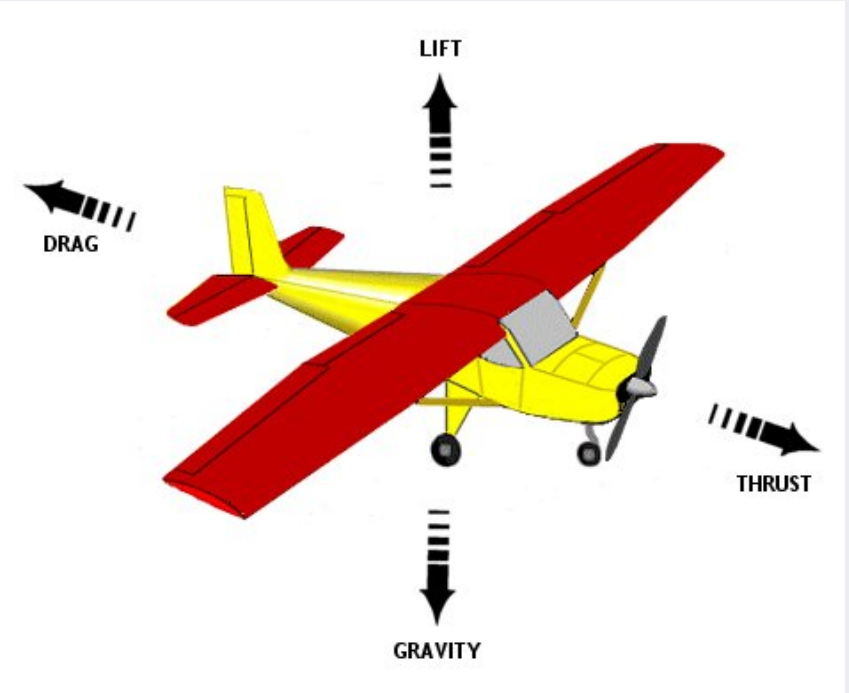

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Basic Components

fuselage

portion of the aircraft that usually contains the crew and payload

empennage

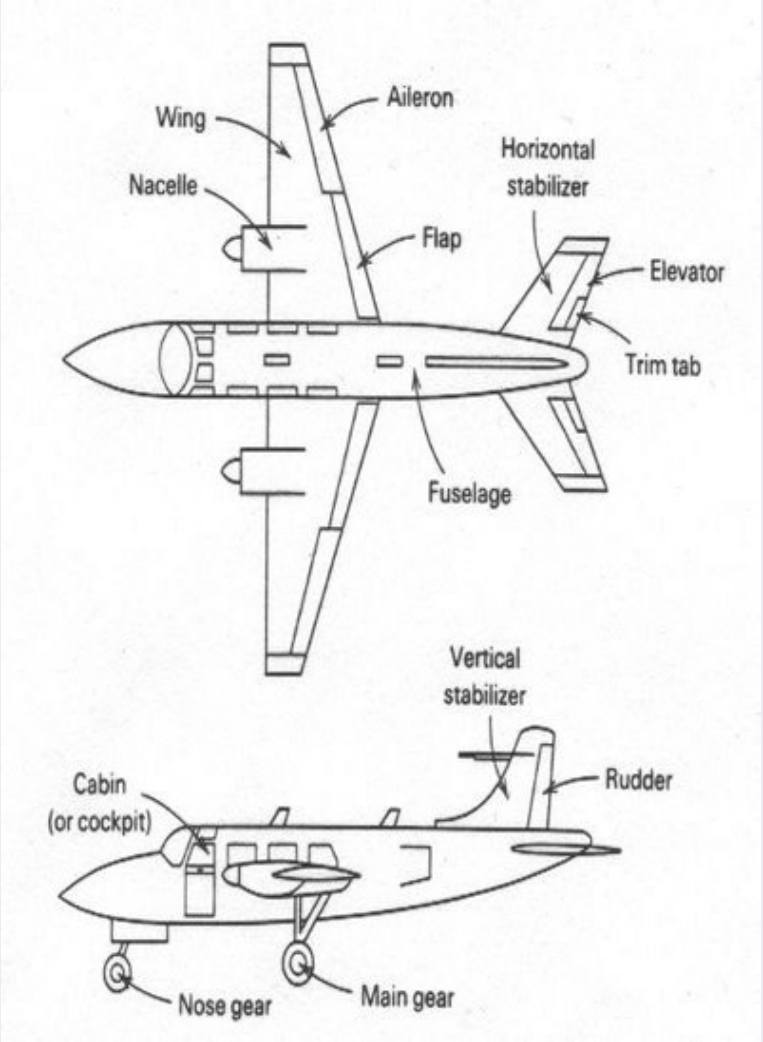
the aft portion of the fuselage plus the horizontal and vertical tails

wing

produces the lift; made up of two halves; mounted to the fuselage

engine

produces thrust



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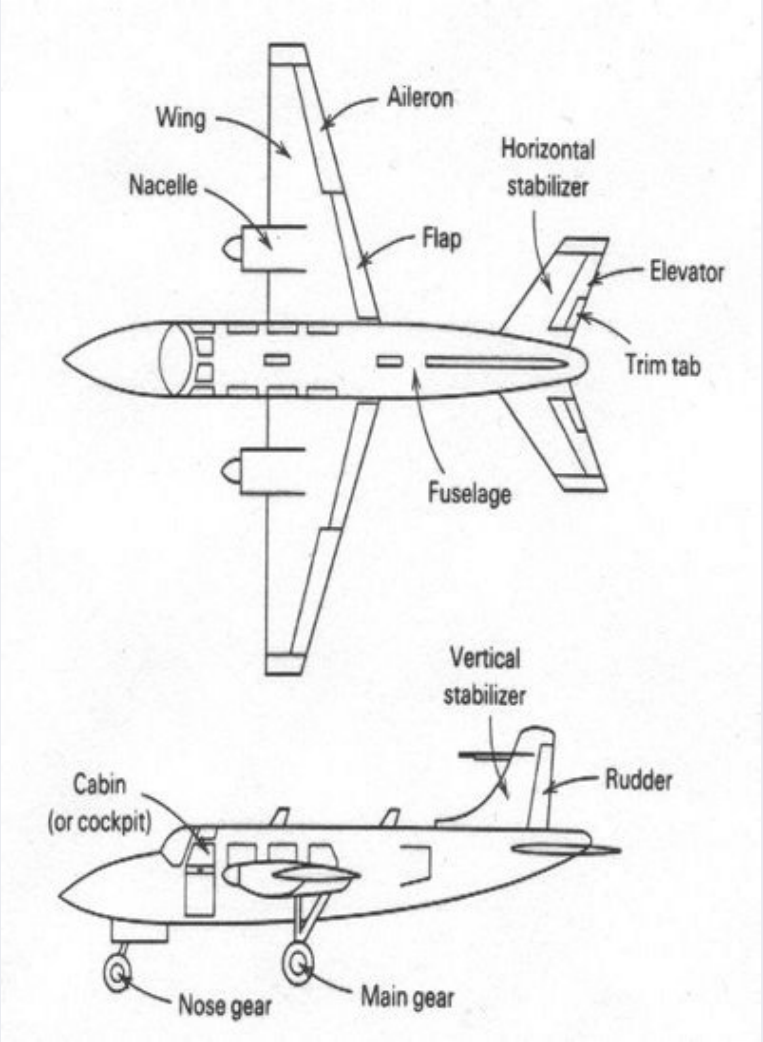

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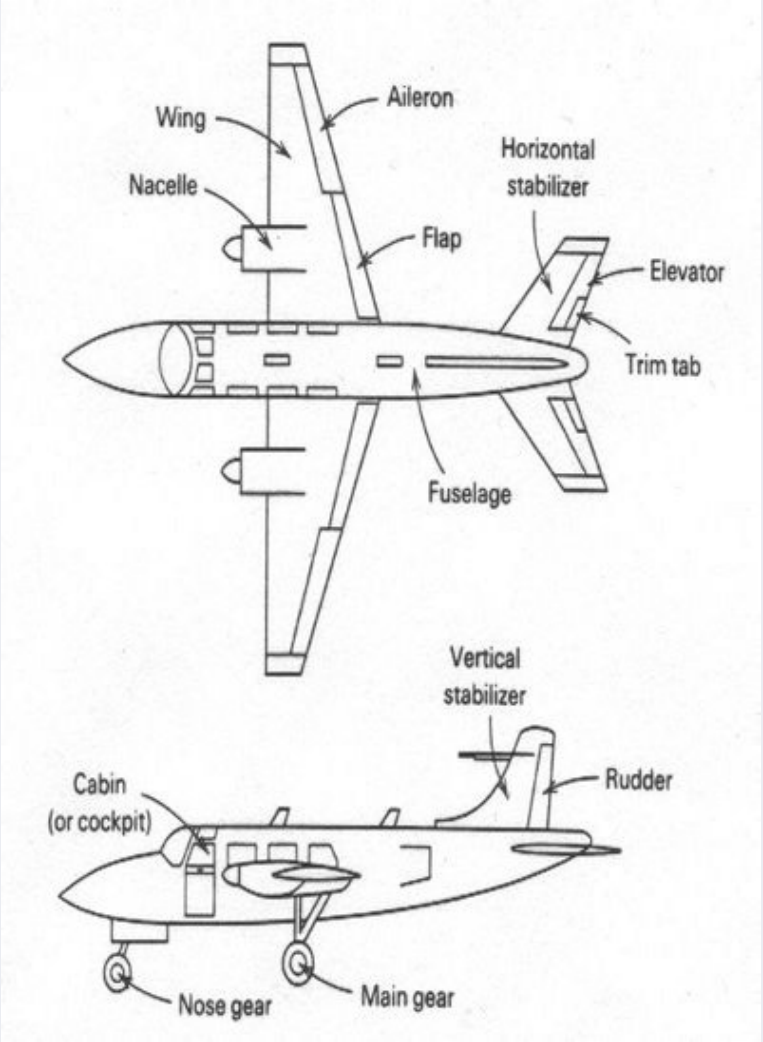

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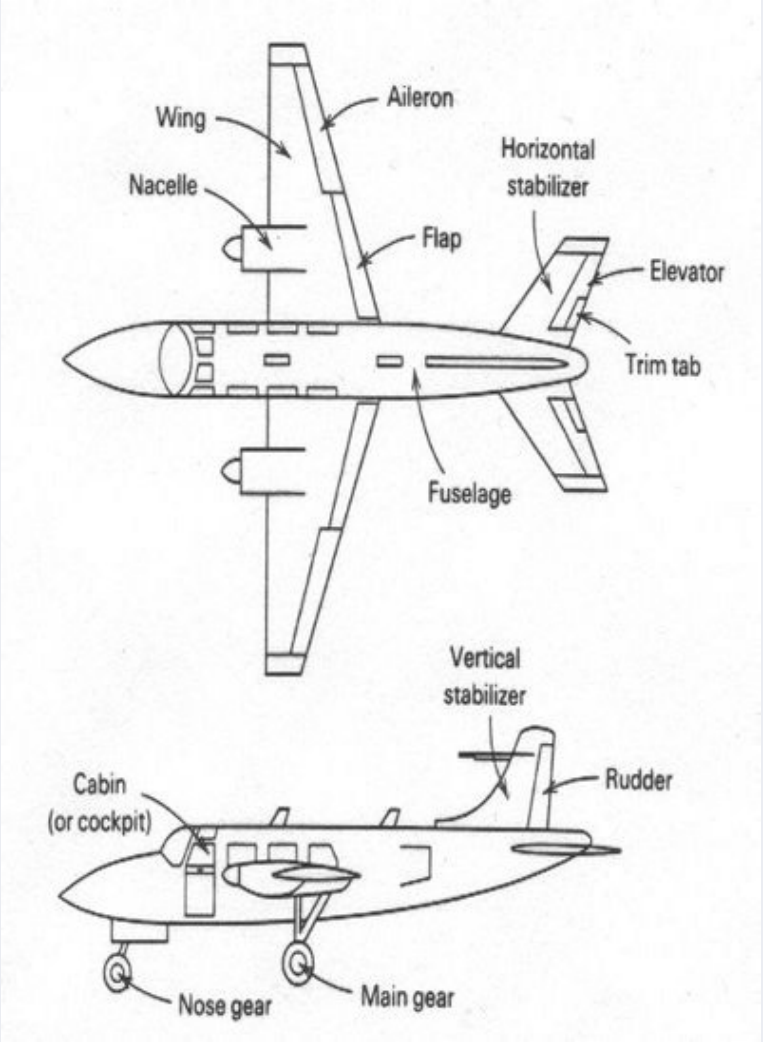

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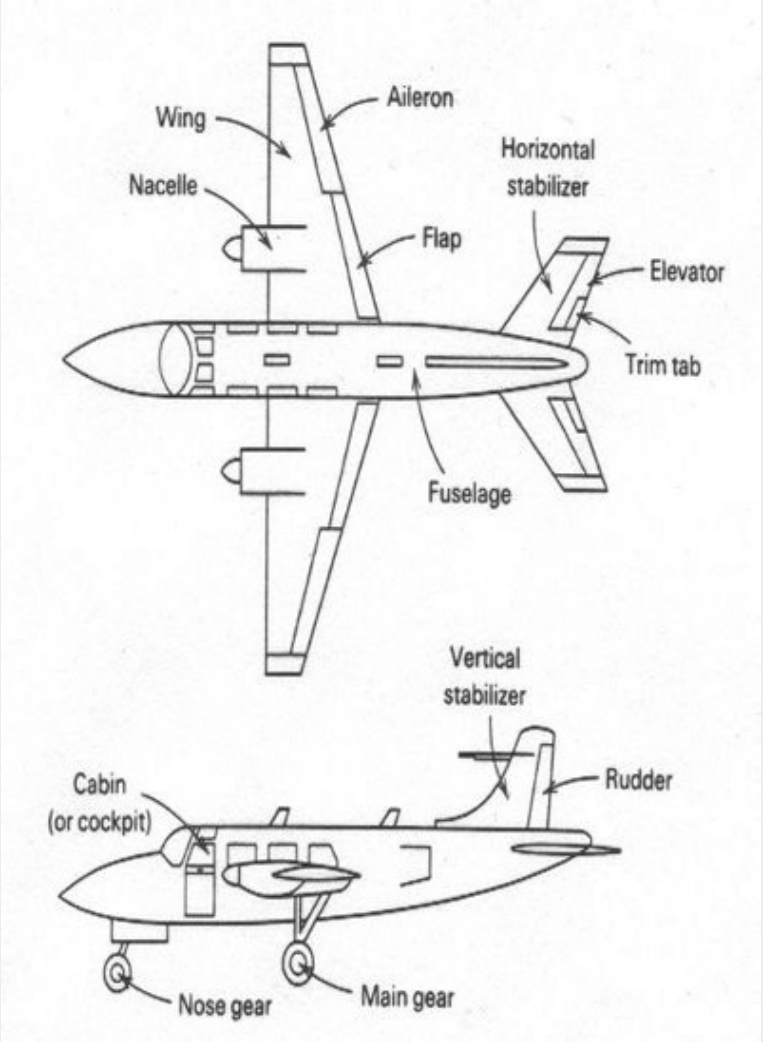

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horizontal stabilizer

performs stability function when an aircraft is disturbed in pitch

vertical stabilizer

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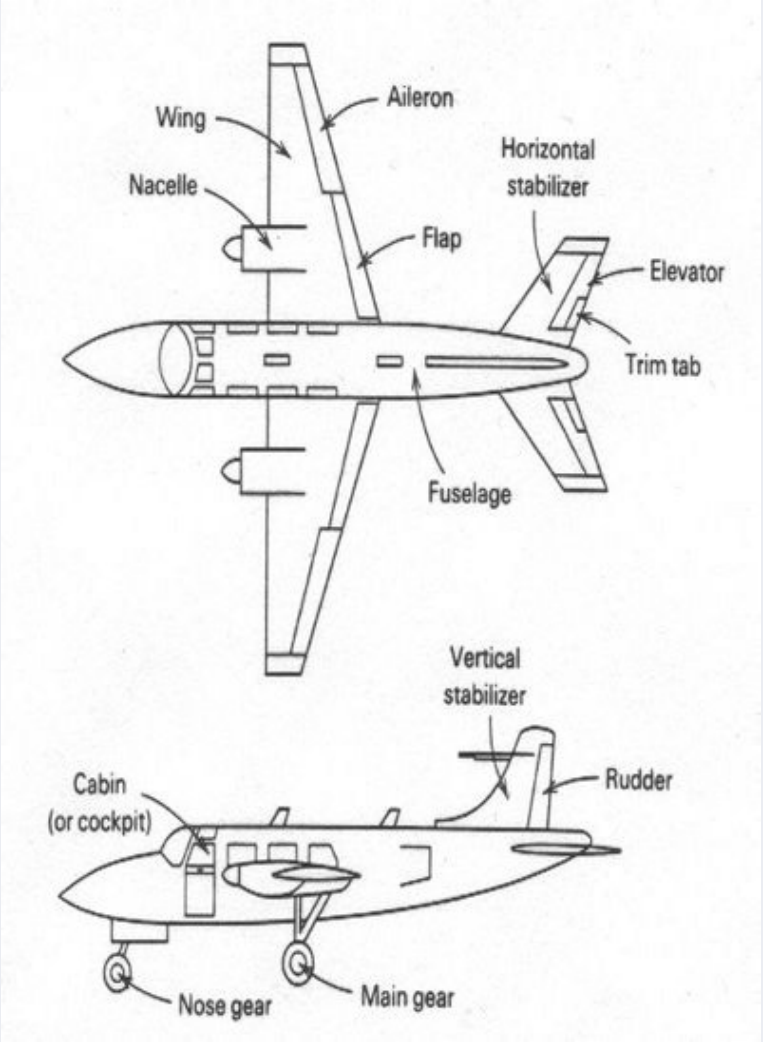

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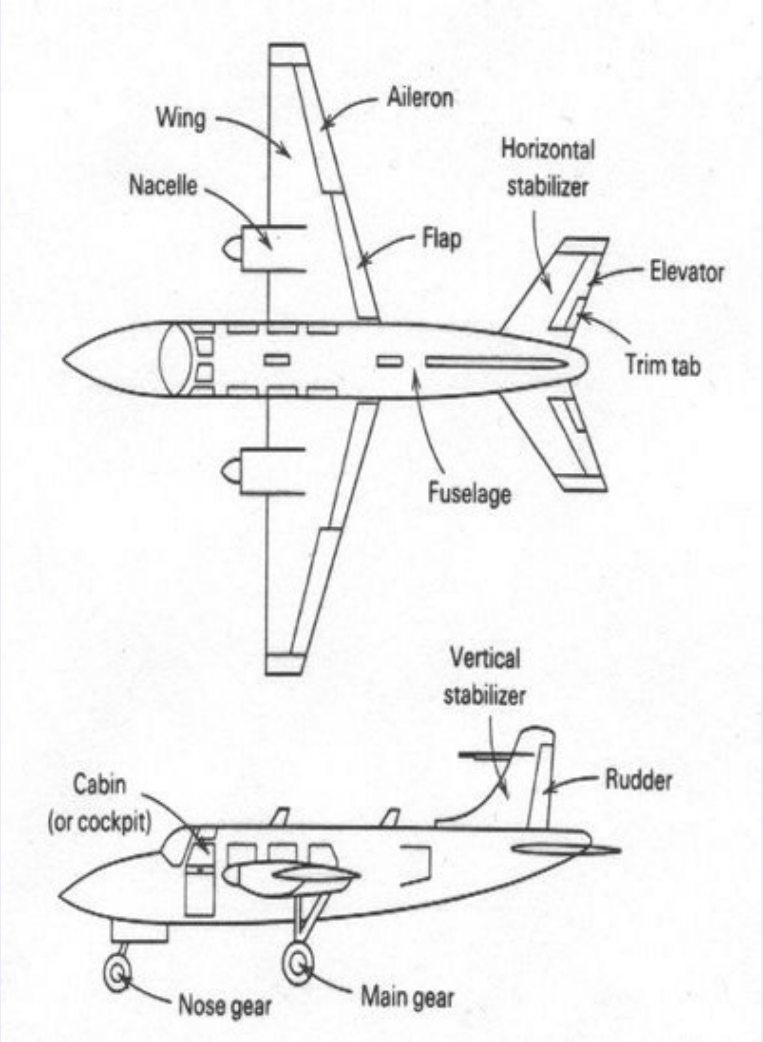


Basic Components

cabin and cockpit

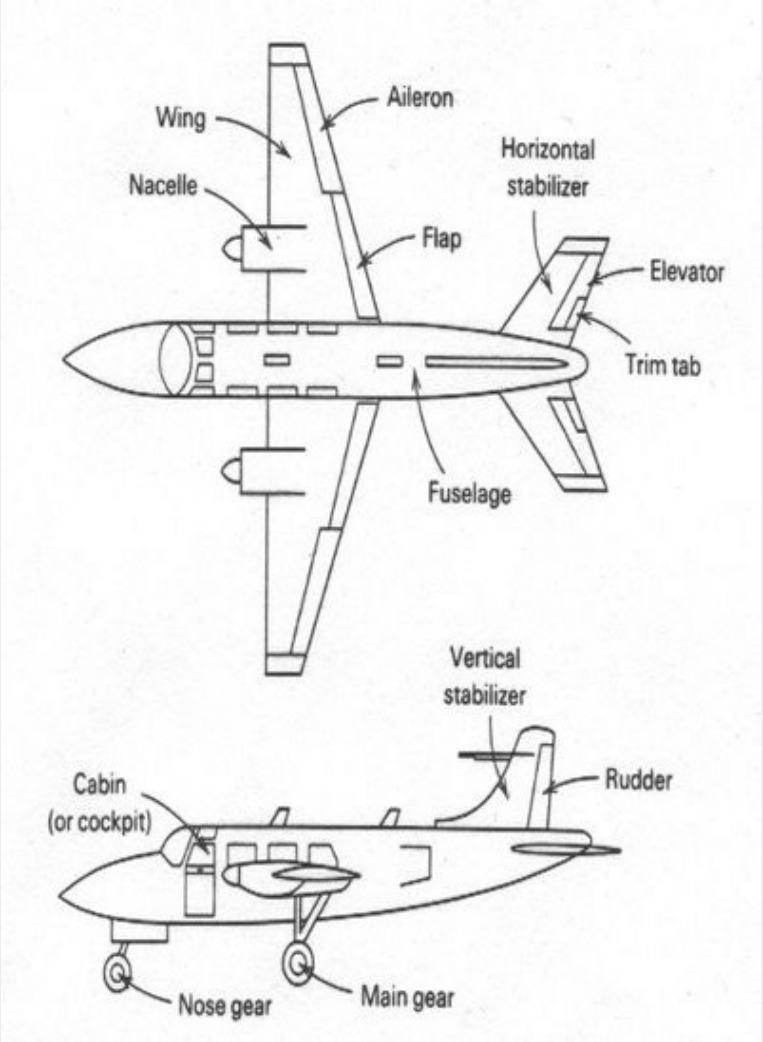
the front of the fuselage where the pilots and flight crew sit

nose and main gear

used during takeoff, landing, and to taxi on the ground

trim tab

increases or decreases the downforce created by the elevator



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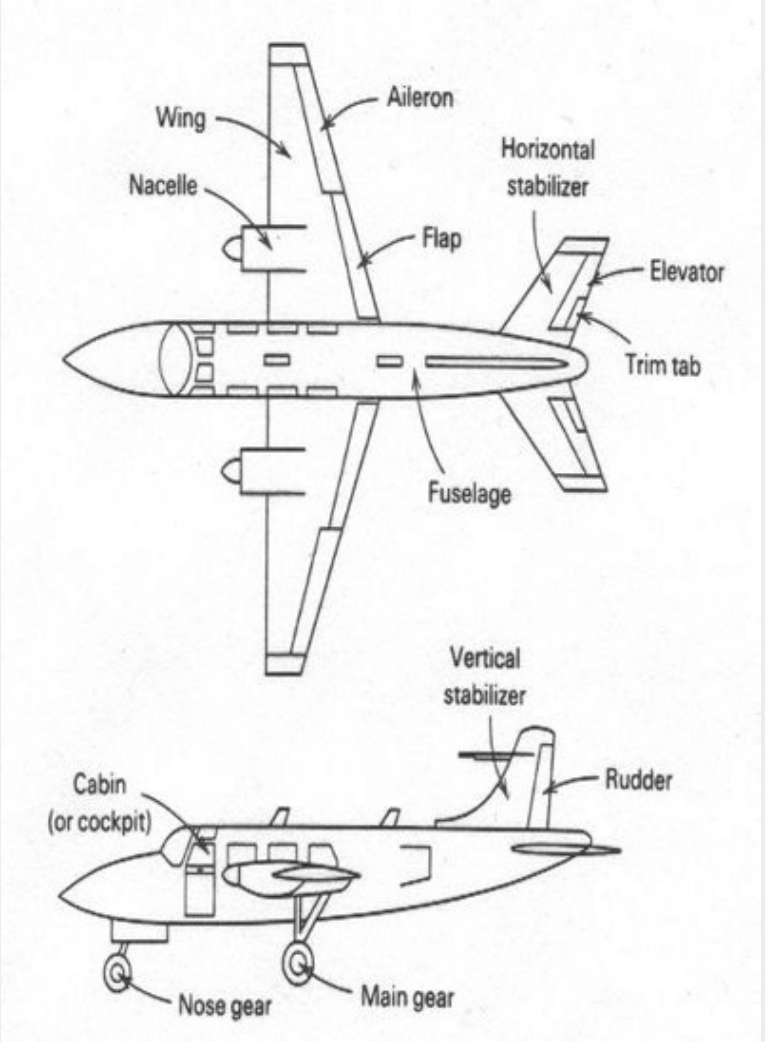

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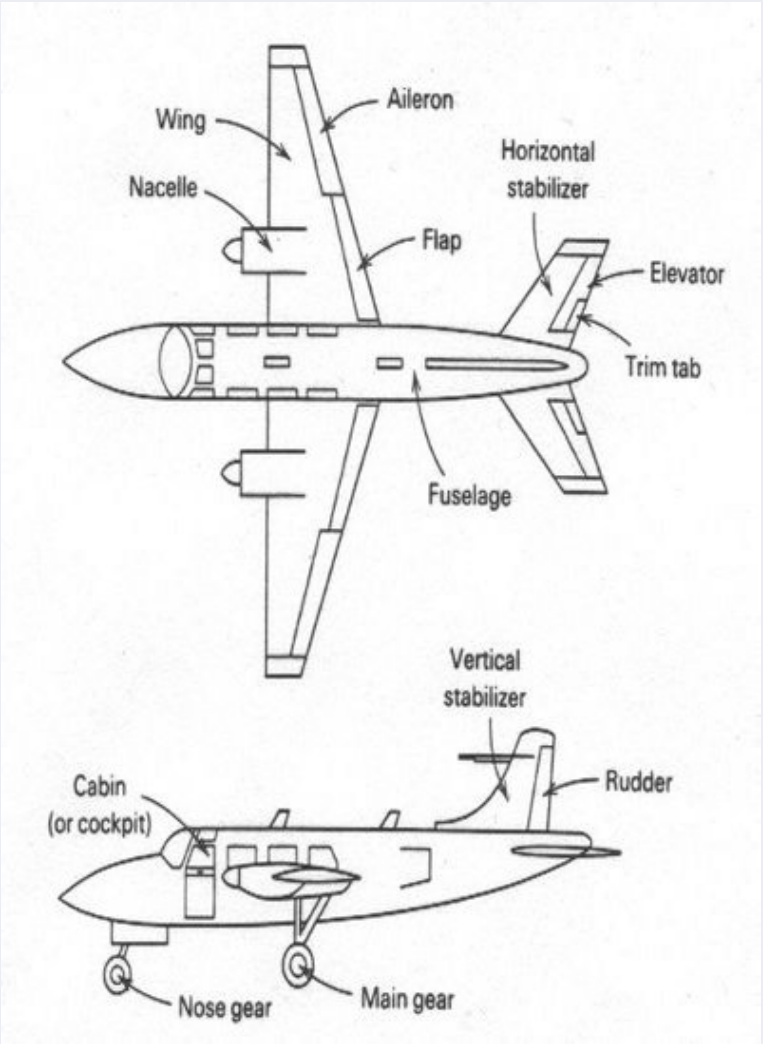

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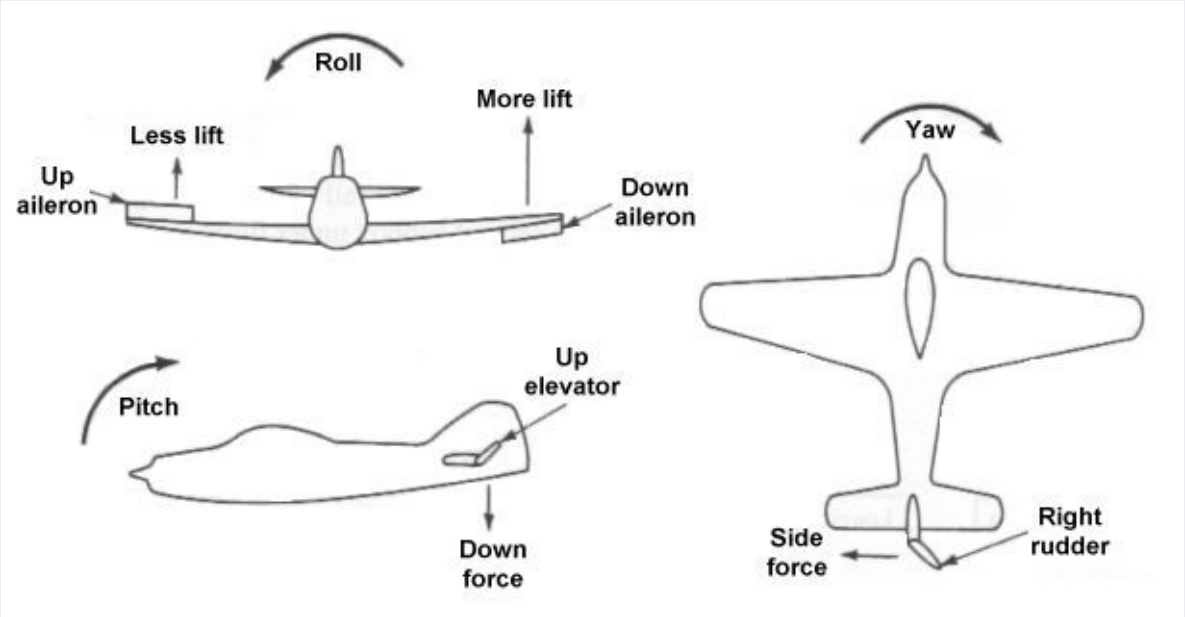

elevator

provides **pitch** control about the aircrafts **lateral** axis

rudder

provide **yaw** control about the aircrafts **vertical** axis

aileron

provide **roll** control about the aircrafts **longtitudinal** axis

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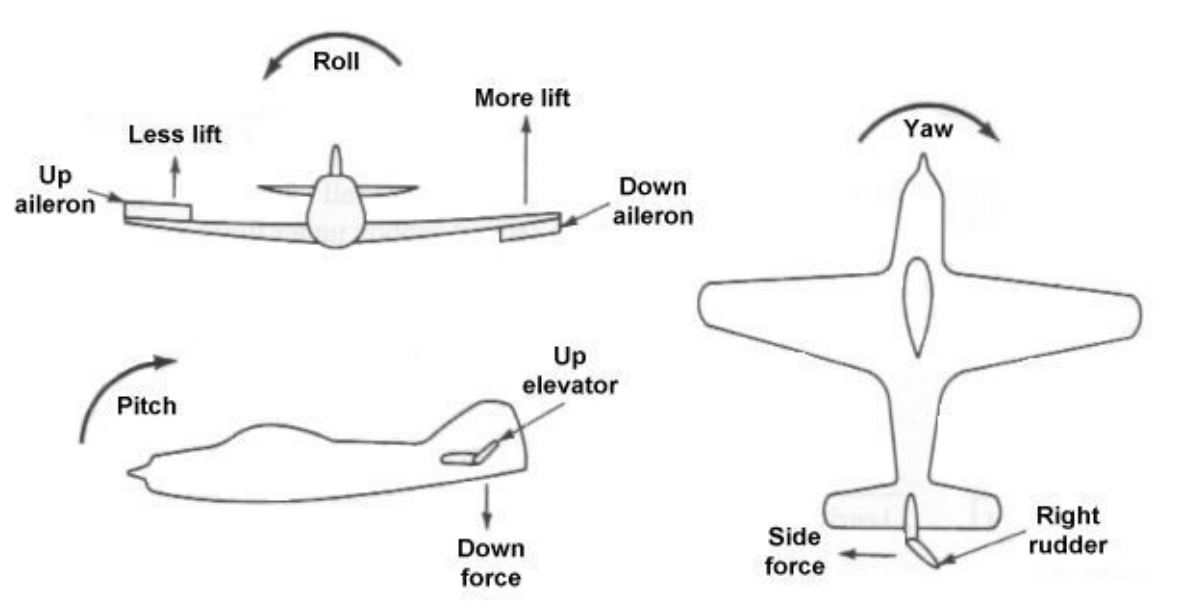

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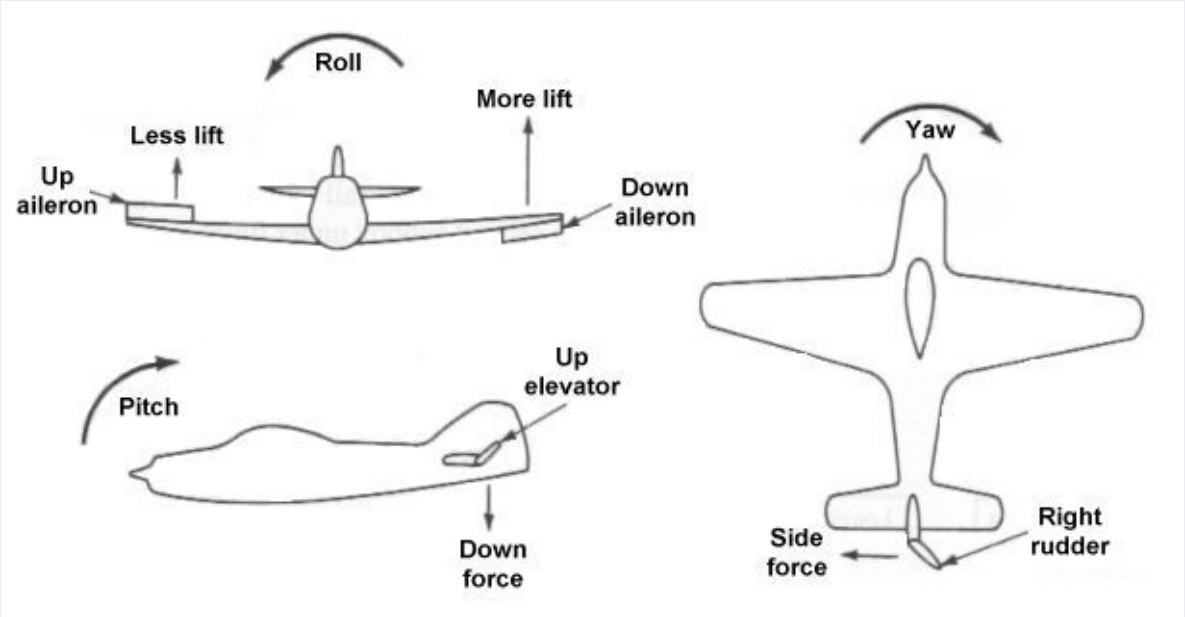

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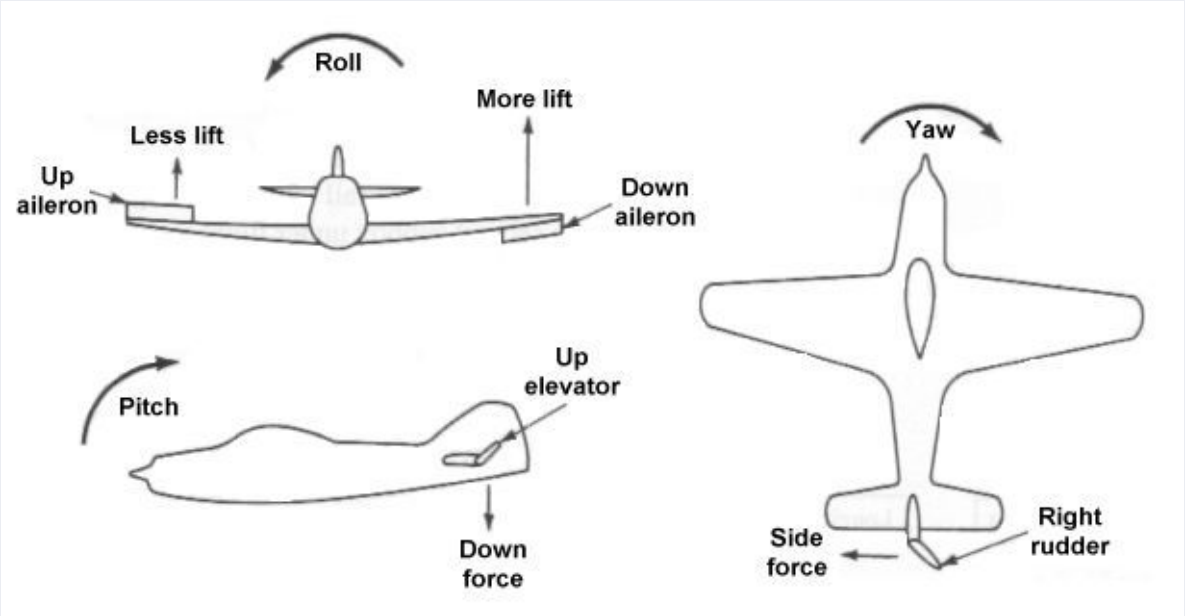

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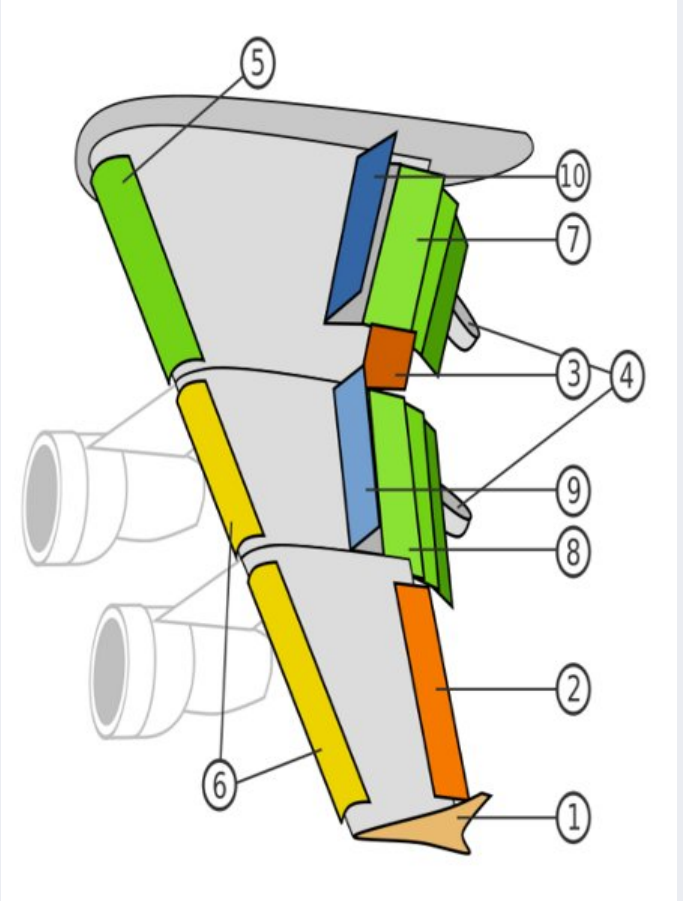
1. Wingtip
2. Low Speed Aileron
3. High Speed Aileron
4. Flap track fairing
5. Krüger flaps
6. Slats
7. Three slotted inner flaps
8. Three slotted outer flaps
9. Spoilers
10. Spoilers Air-brakes



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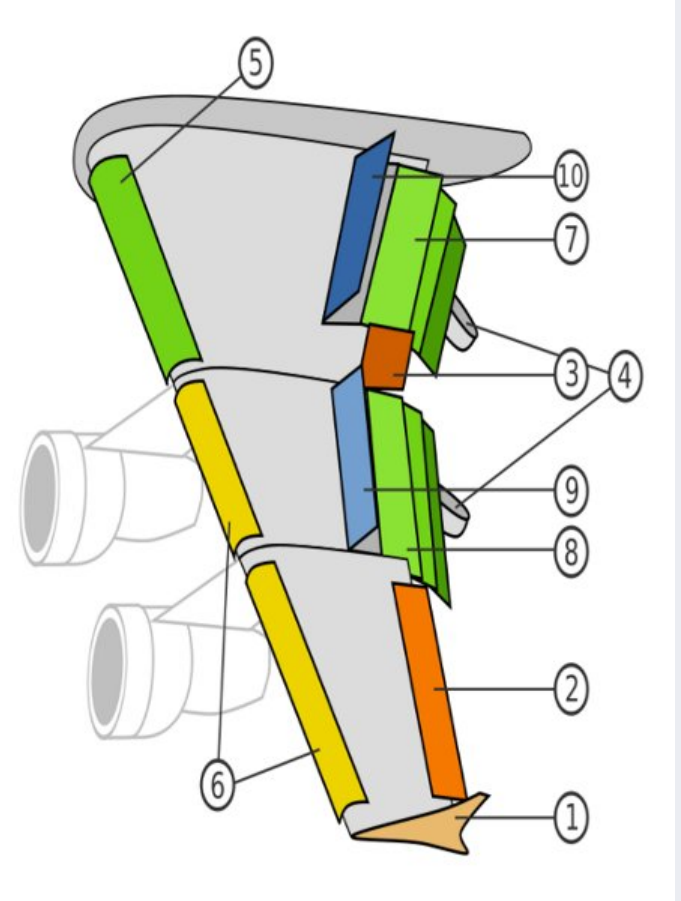

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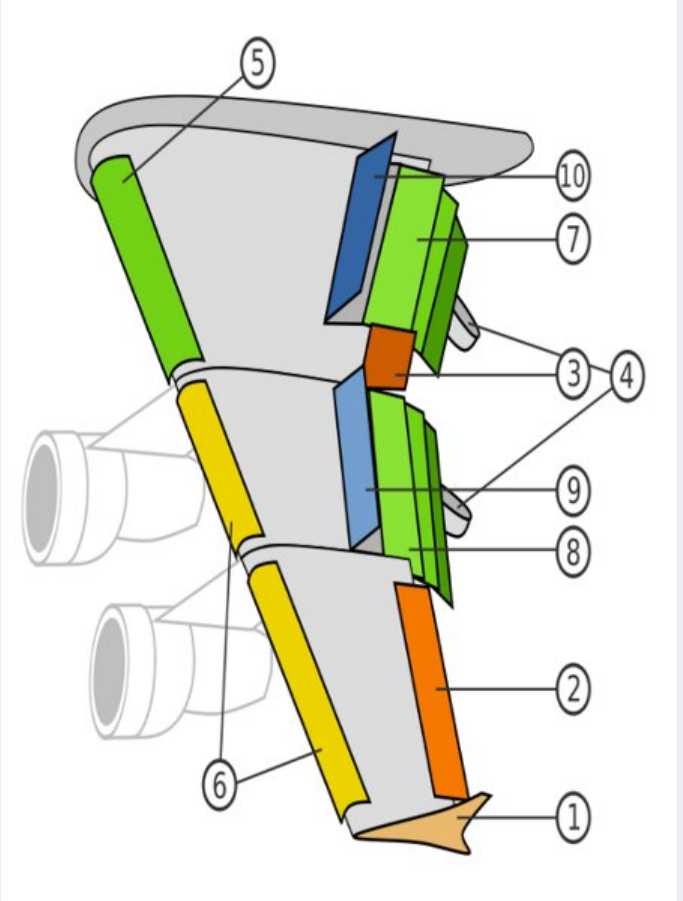

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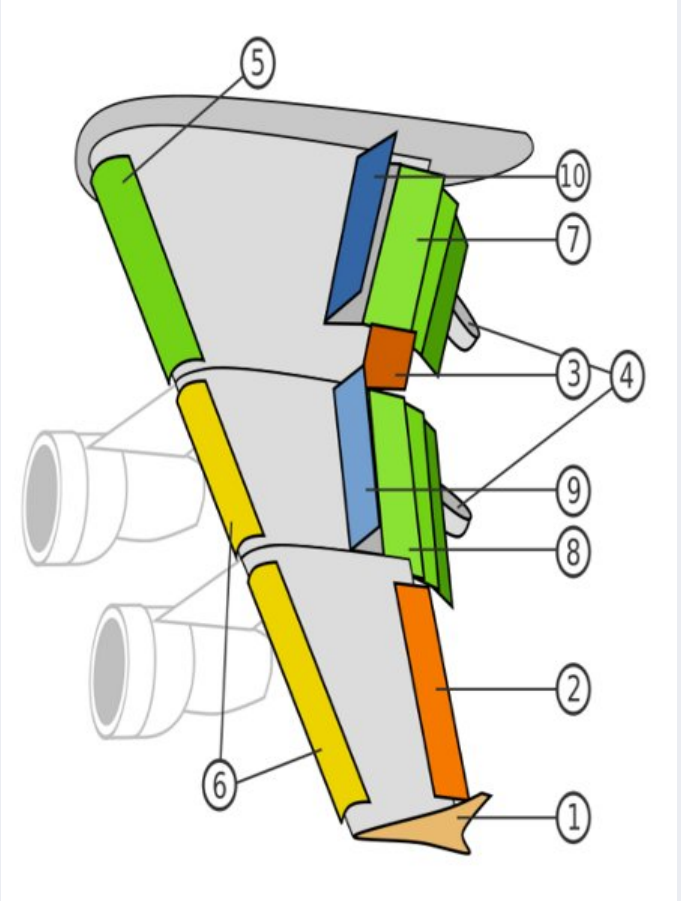

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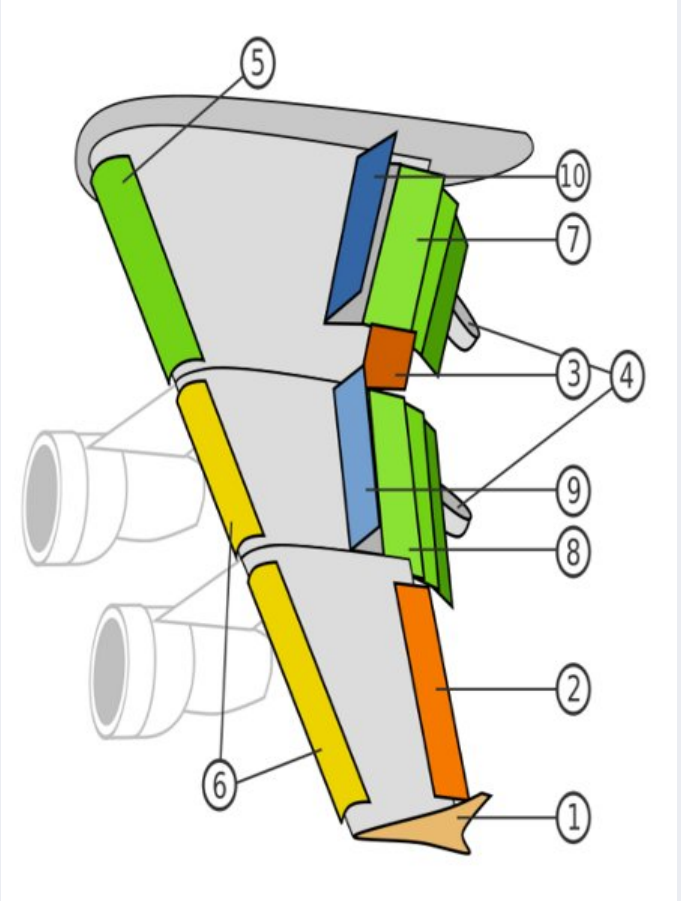

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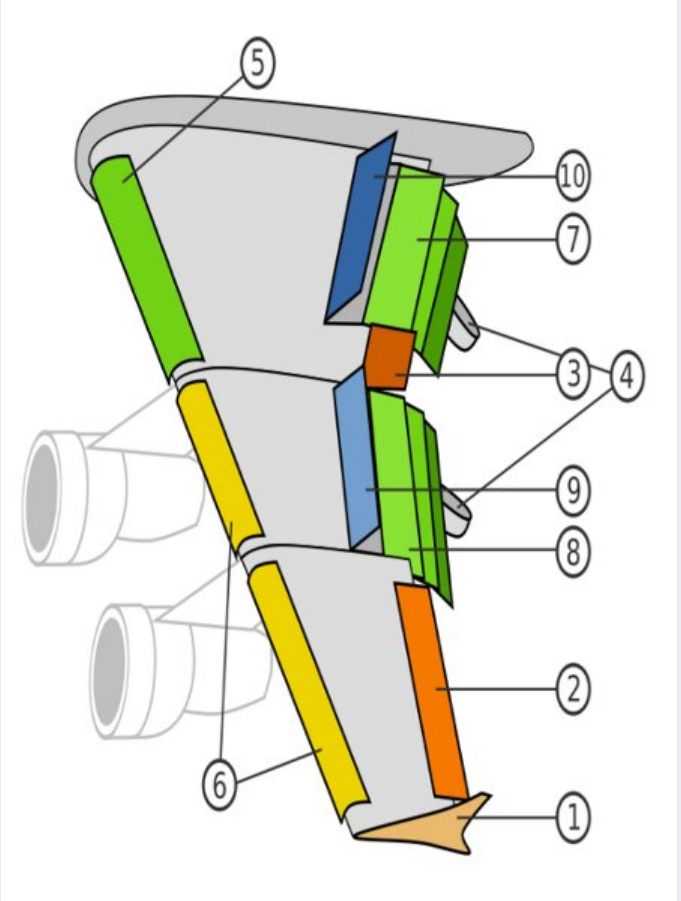

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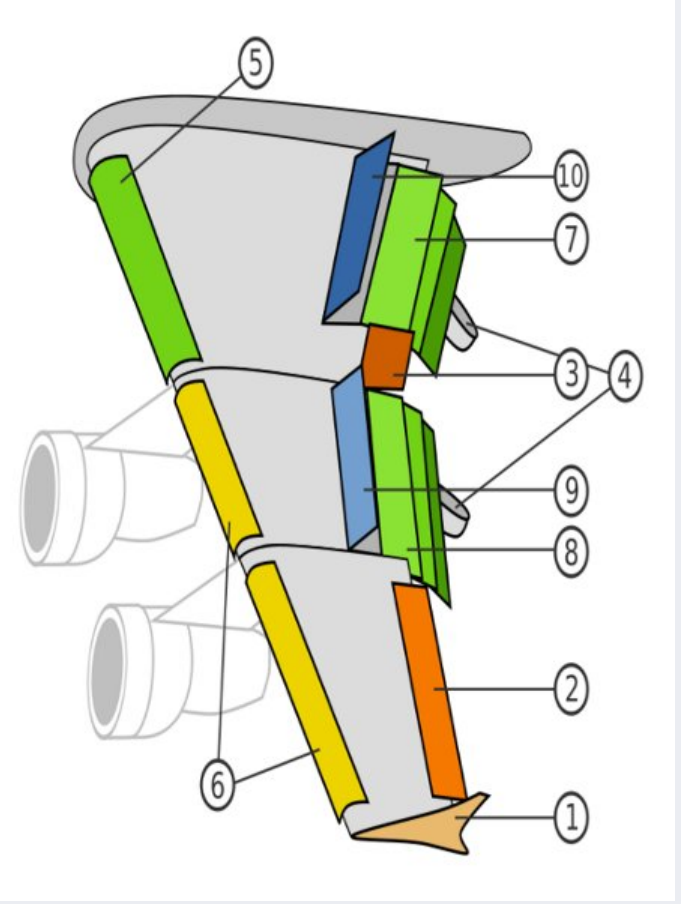
The part of the wing that is most distant from the fuselage of a fixed-wing aircraft

The wing tip shape **influences** the **size** and **drag** of the **wingtip vortices**

Winglet

A near-vertical extension of the wing tips

Increases efficiency by **reducing vortex interference** with **laminar airflow** near the tips of the wing



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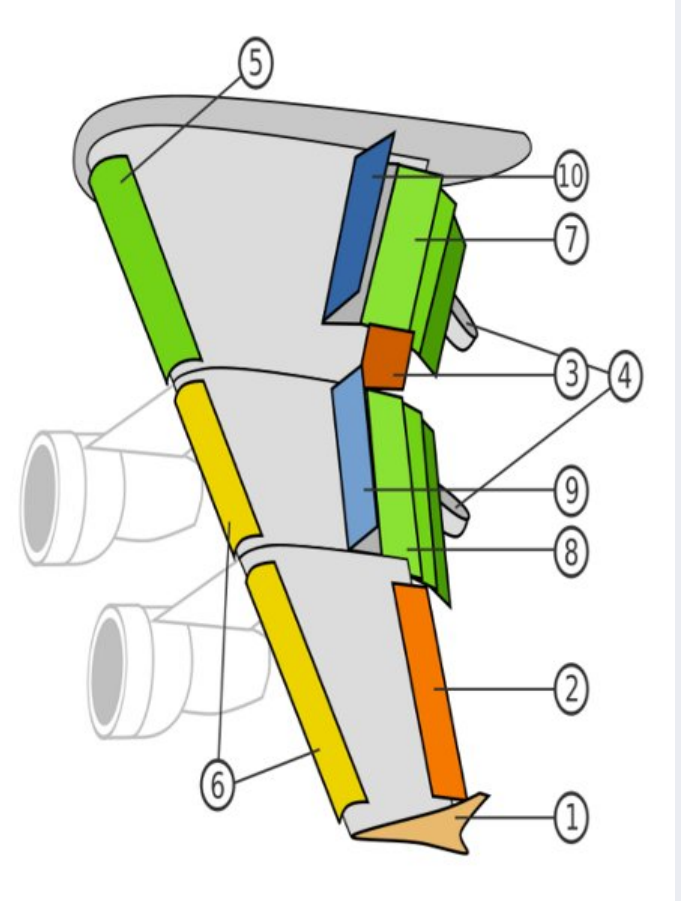

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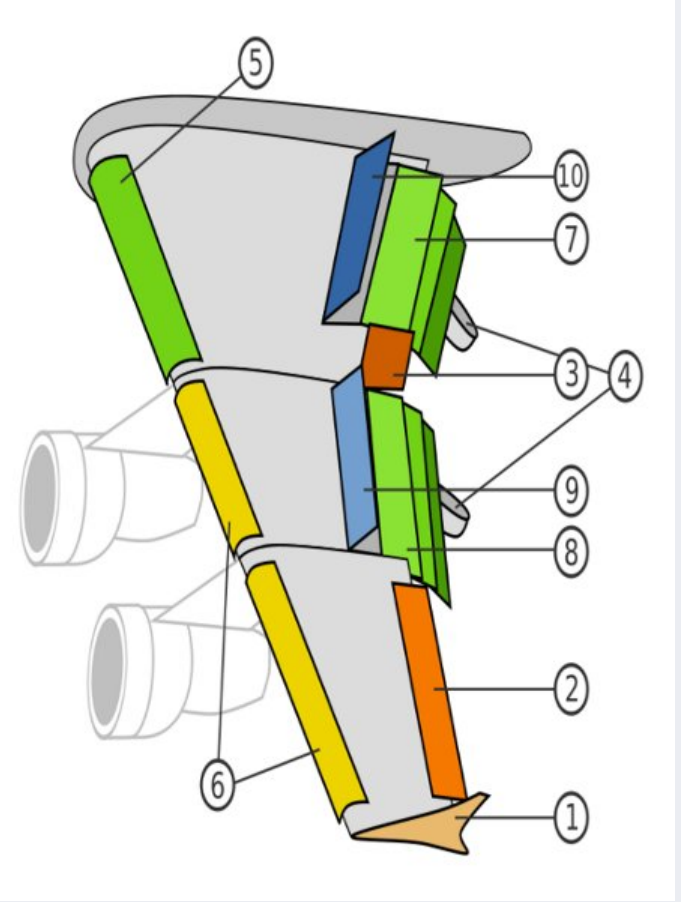

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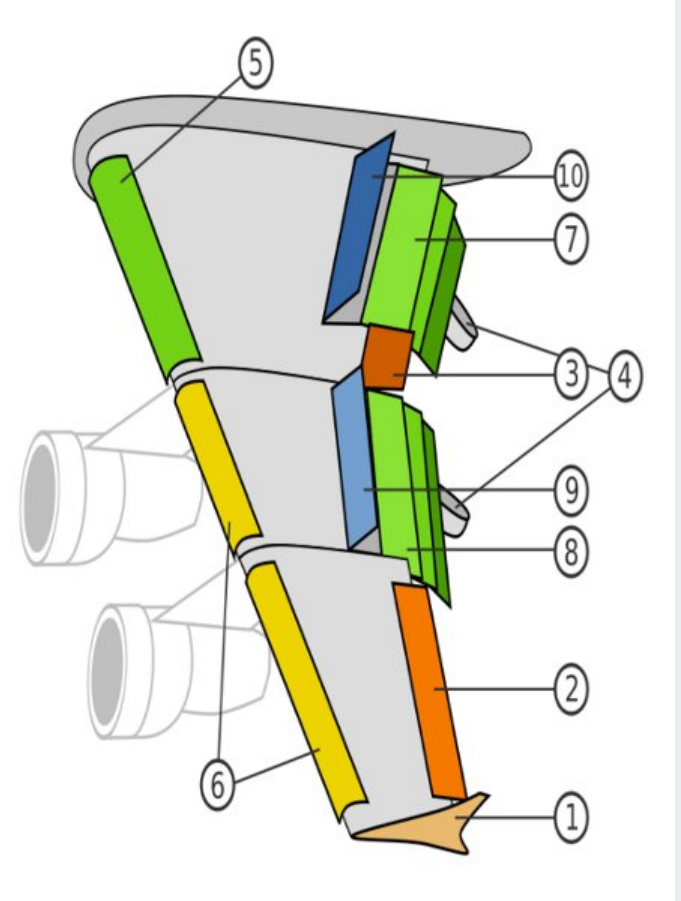

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5.,6. Slats

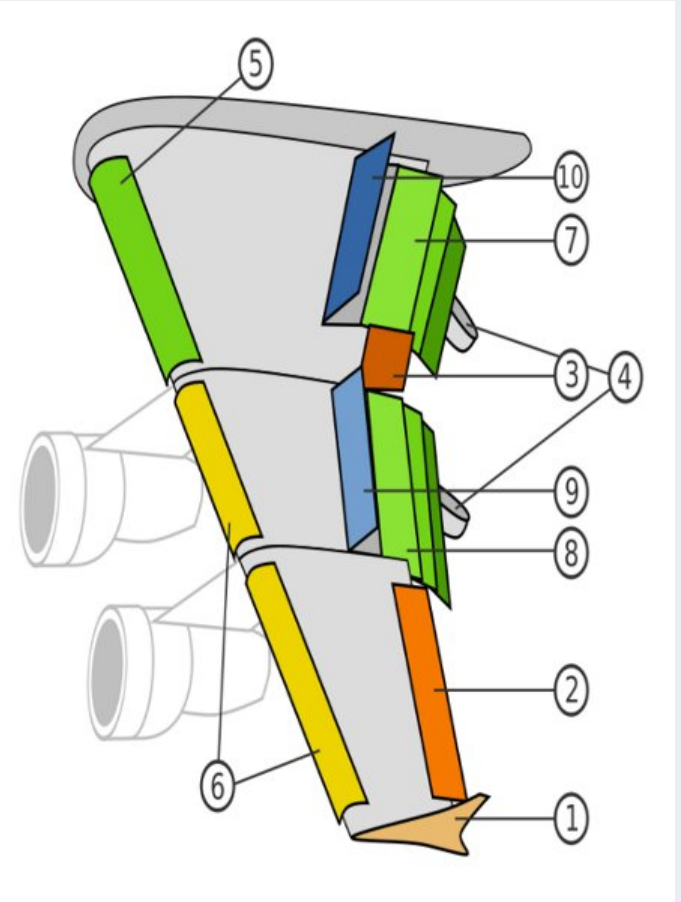
Aerodynamic surfaces on the leading edge of the wings

Allow the wing to operate at a higher angle of attack; an aircraft can **fly slower** or **take off** (**land**) in a **shorter distance**

7.,8. Flaps

Surfaces hinged on the trailing edge of the wings

Reduce stalling speed of the aircraft; an aircraft can **fly** safely at **slower speeds**



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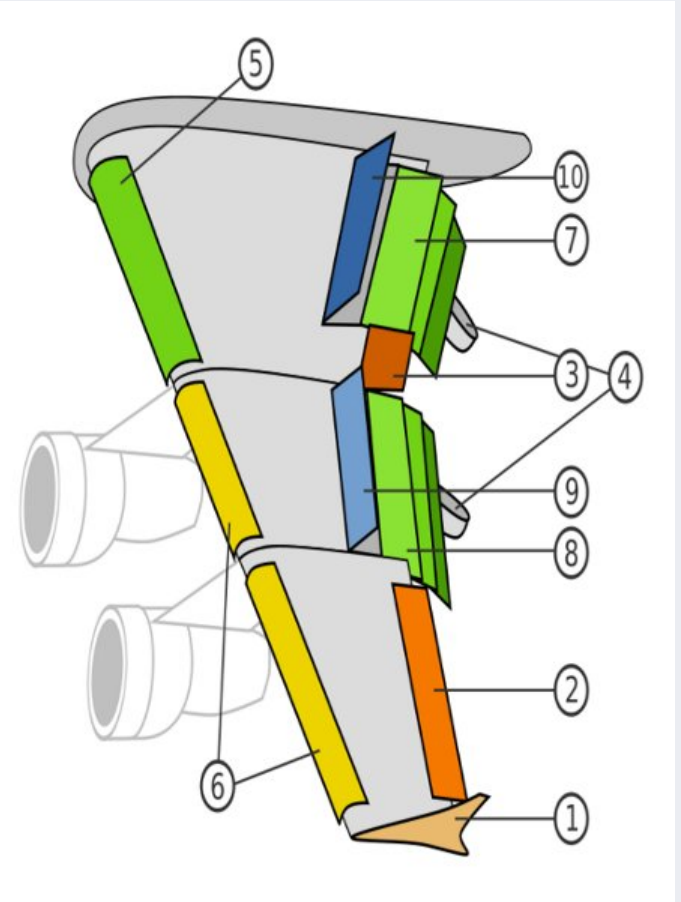
Reduce stalling speed of the aircraft; an aircraft can **fly** safely at **slower speeds**



Control surfaces at the wing of a plane

5.,6. Slats

Aerodynamic surfaces on the leading edge of the wings

Allow the wing to operate at a higher angle of attack; an aircraft can **fly slower** or **take off** (**land**) in a **shorter distance**

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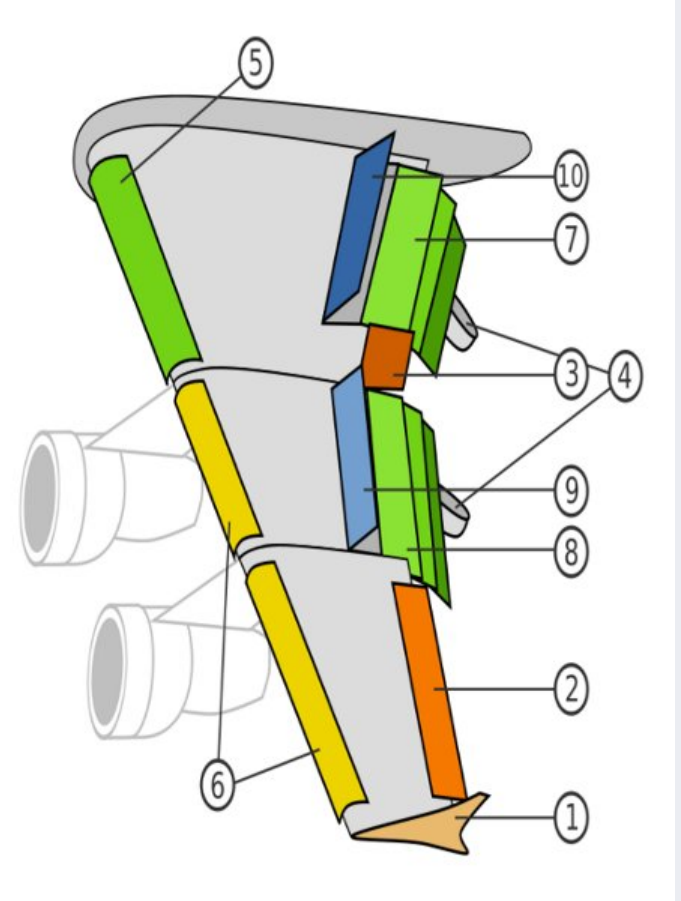

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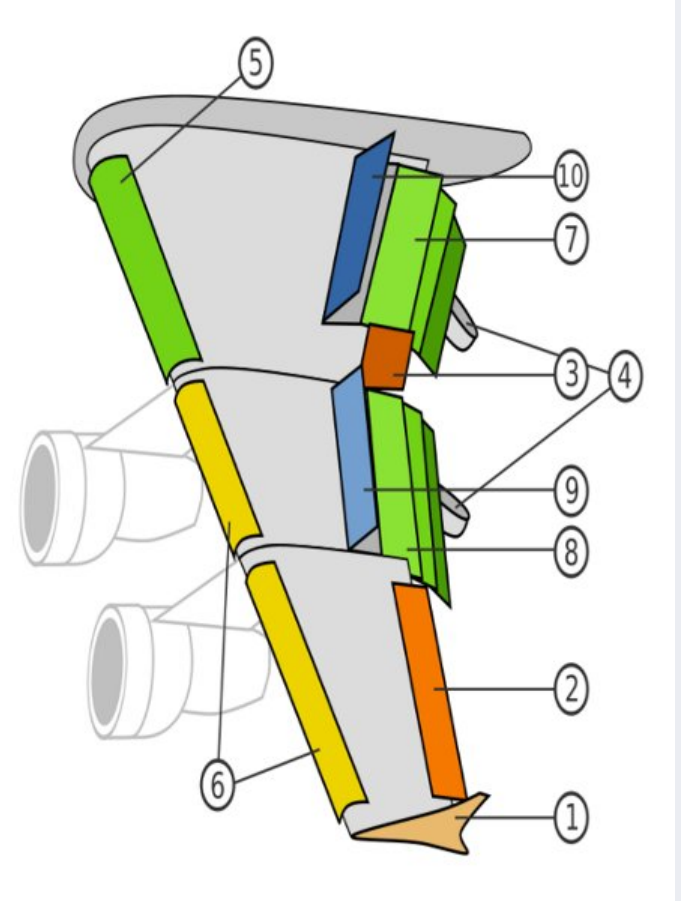


Control surfaces at the wing of a plane

9. Spoilers

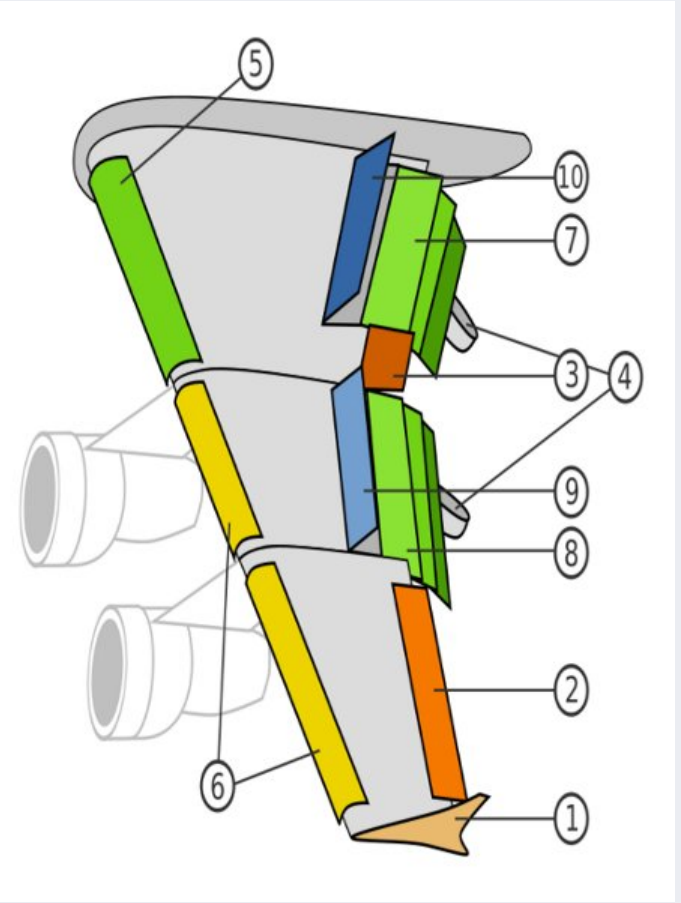
Plates on the top surface of a wing

Reduce lift in an aircraft

10. Air brakes

Increase drag in an aircraft

Spoilers differ from airbrakes in that **air-brakes** are designed to **increase drag** making **little change** to **lift**, while **spoil-ers** greatly **reduce lift** making only a **moderate increase** in **drag**.



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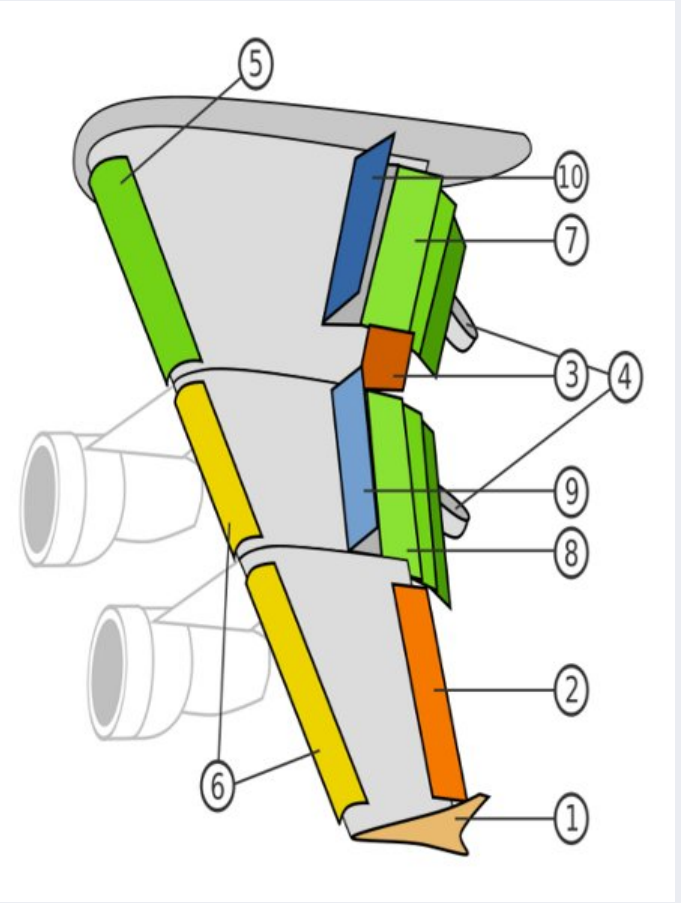

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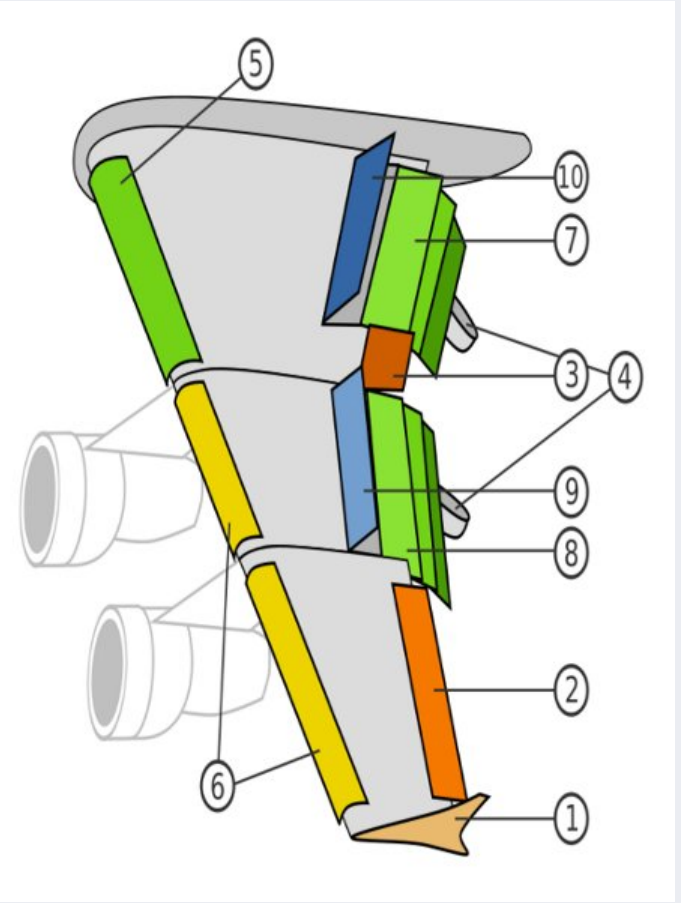

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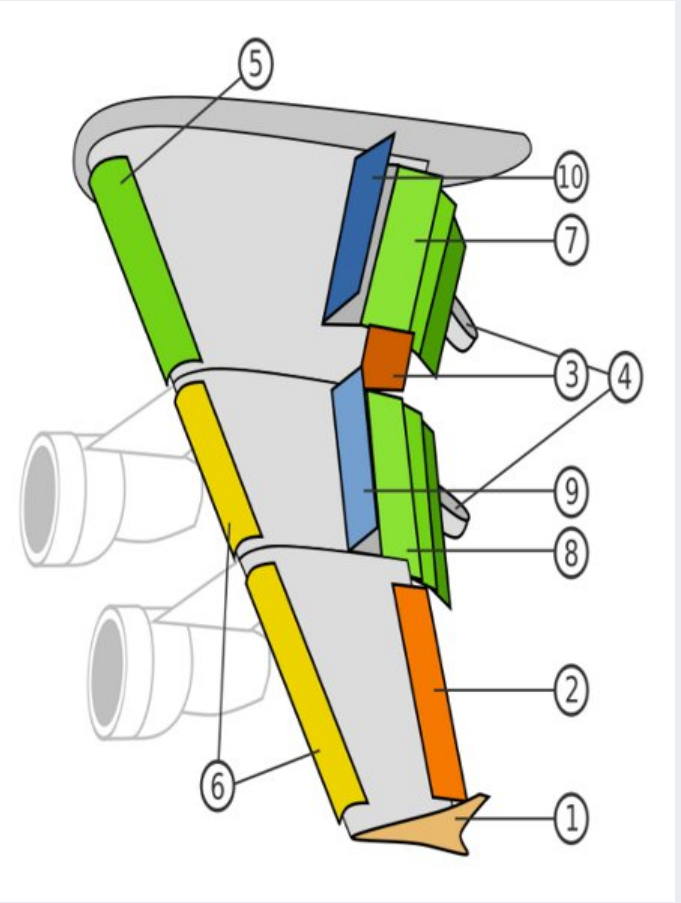

Jet aircraft. Jet engine

Jet aircraft

an aircraft propelled by jet engines

Jet engine

a reaction engine that **discharges** a fast moving **jet of fluid** to generate **thrust** in accordance with Newton's laws of motion

This broad definition of jet engines includes

- turbojets,
- turbofans,
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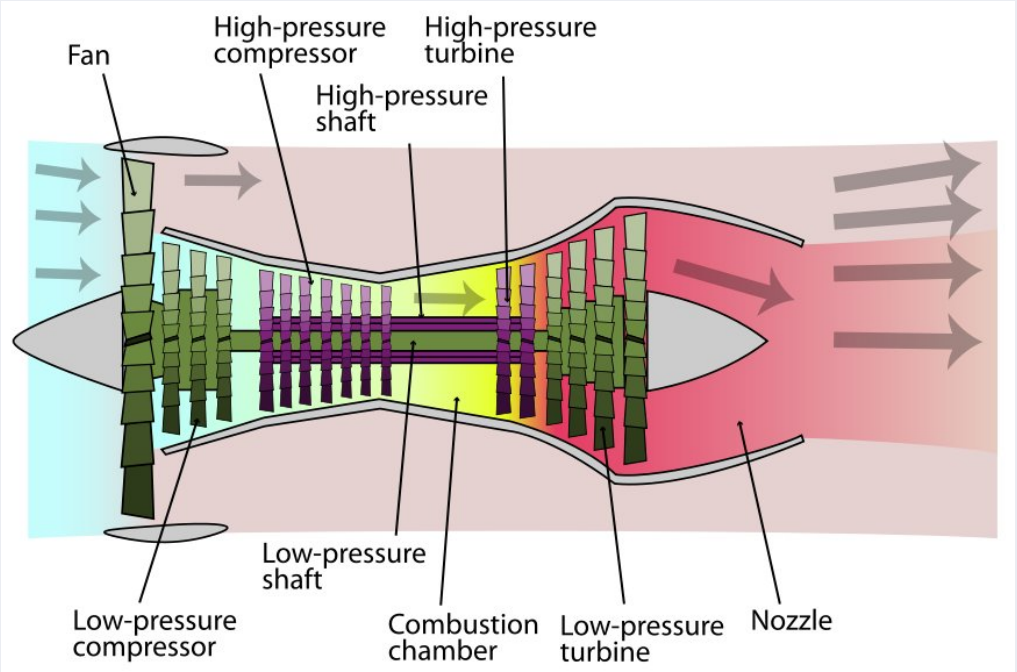
Jet engine major components

Cold Section:



Air intake (Inlet)

brings the air into the engine

Compressor or Fan

consists of vanes which rotate, and stators which remain stationary;

increases pressure of the **air**;

energy is **derived** from the **turbine**, passed along the shaft

Bypass ducts

used for bypassing the combustion chamber by air from the front compressor

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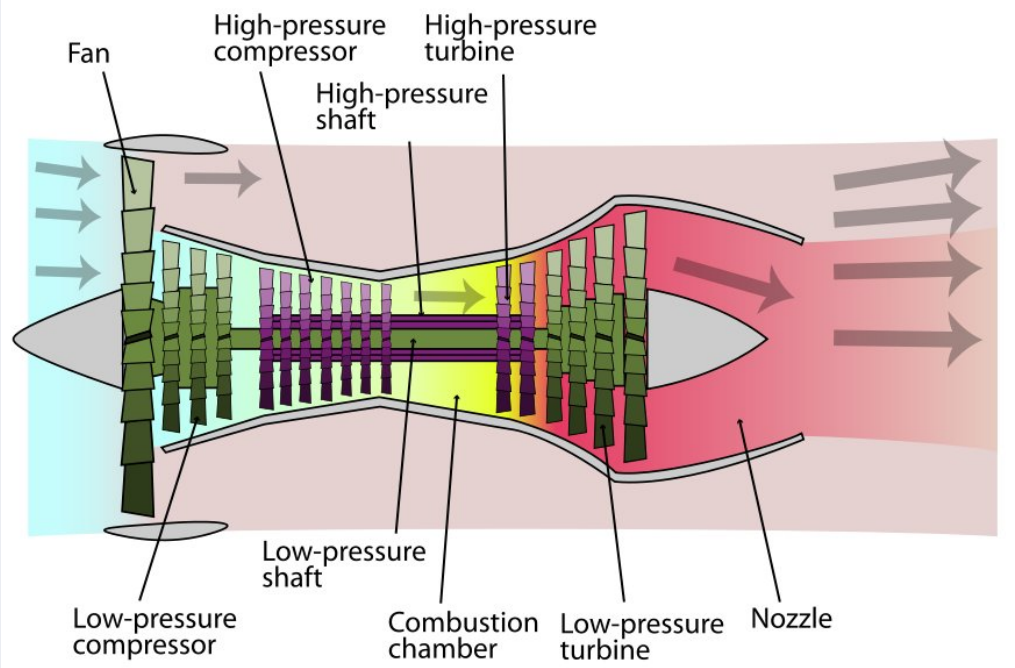

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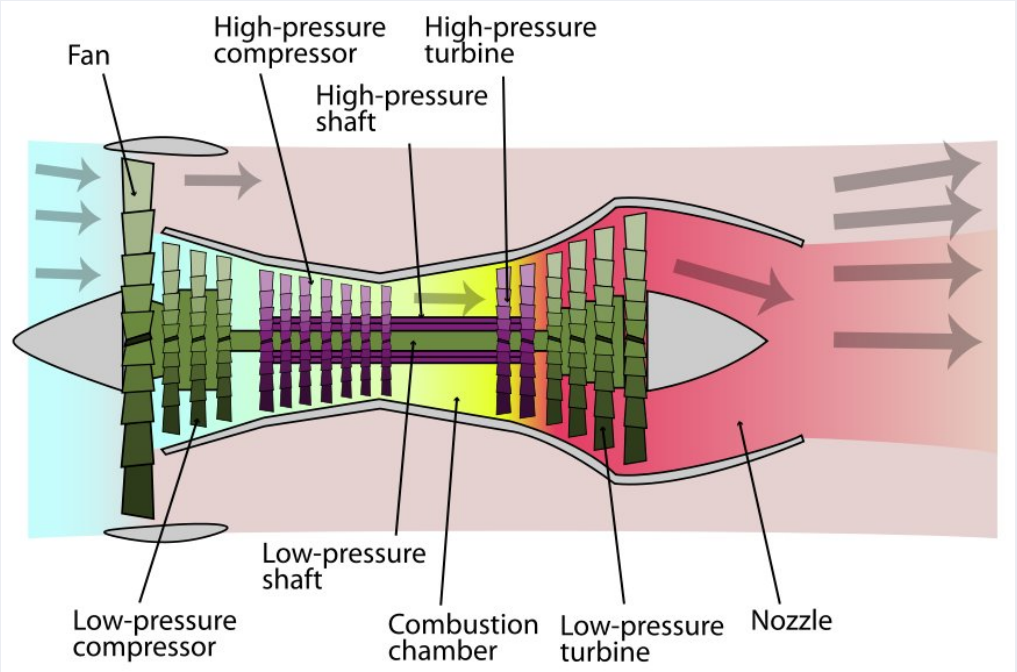

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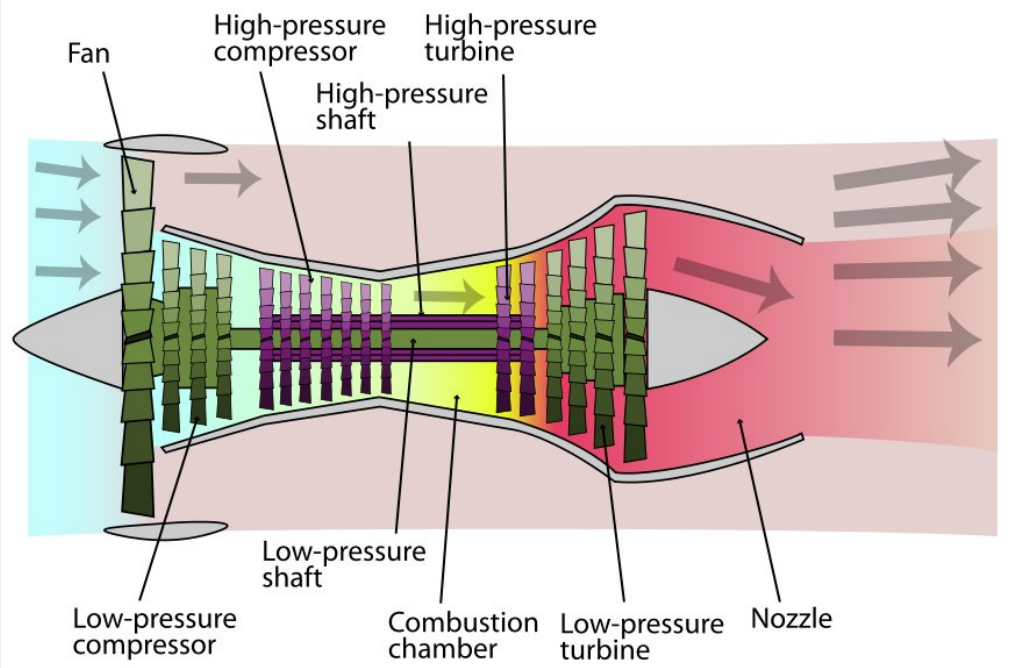

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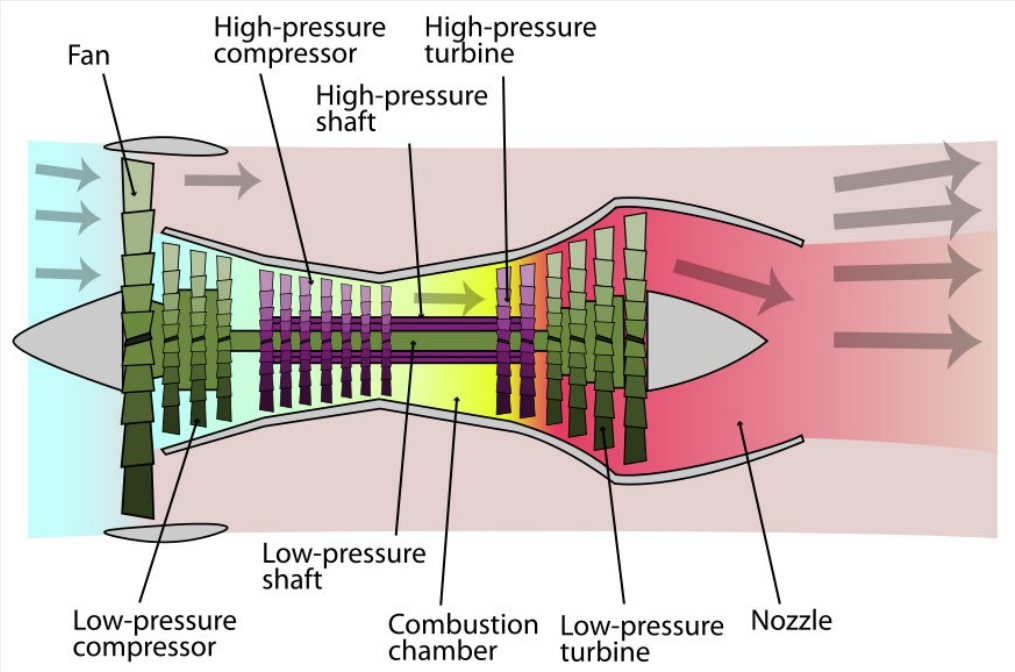
divergent duct that utilizes Bernoulli's principle

- to decrease the velocity of the compressed air to allow for easier ignition
- to increase the air pressure before it enters the combustion chamber



Common:

Shaft

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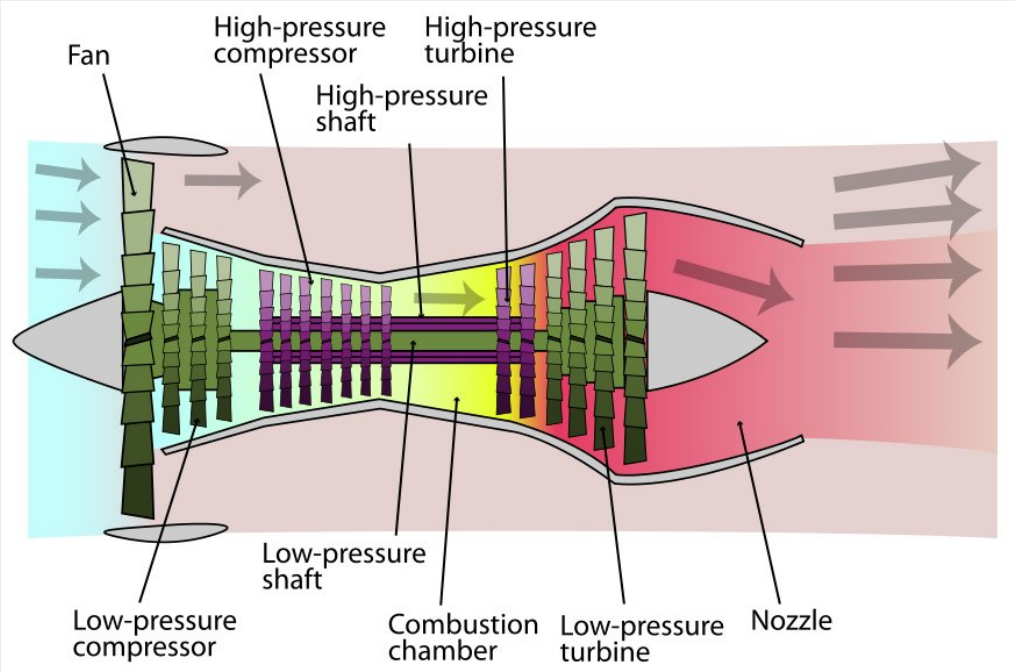

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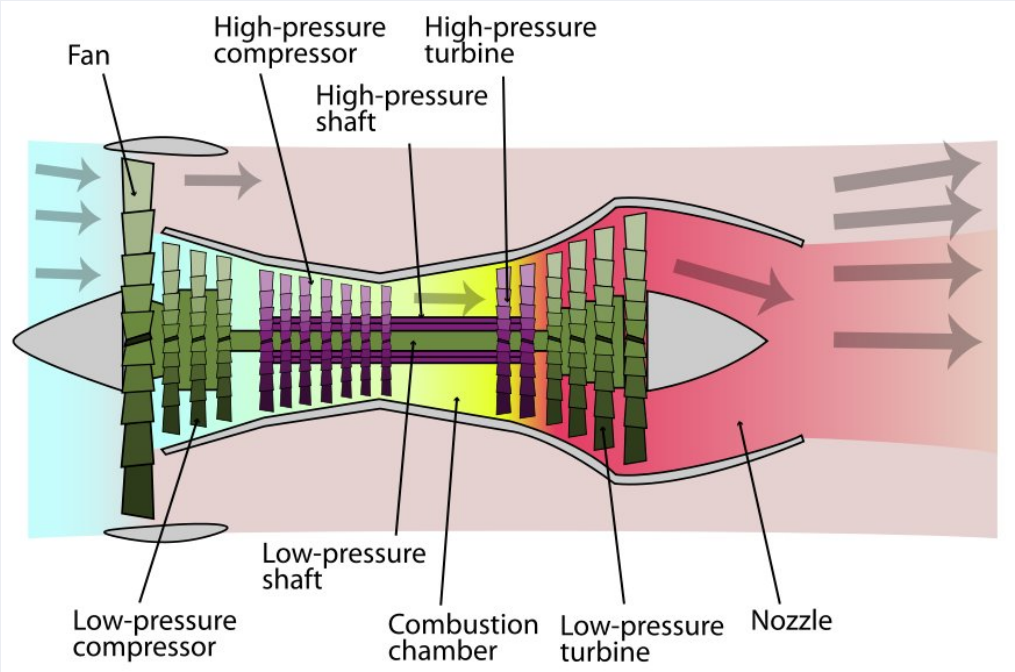

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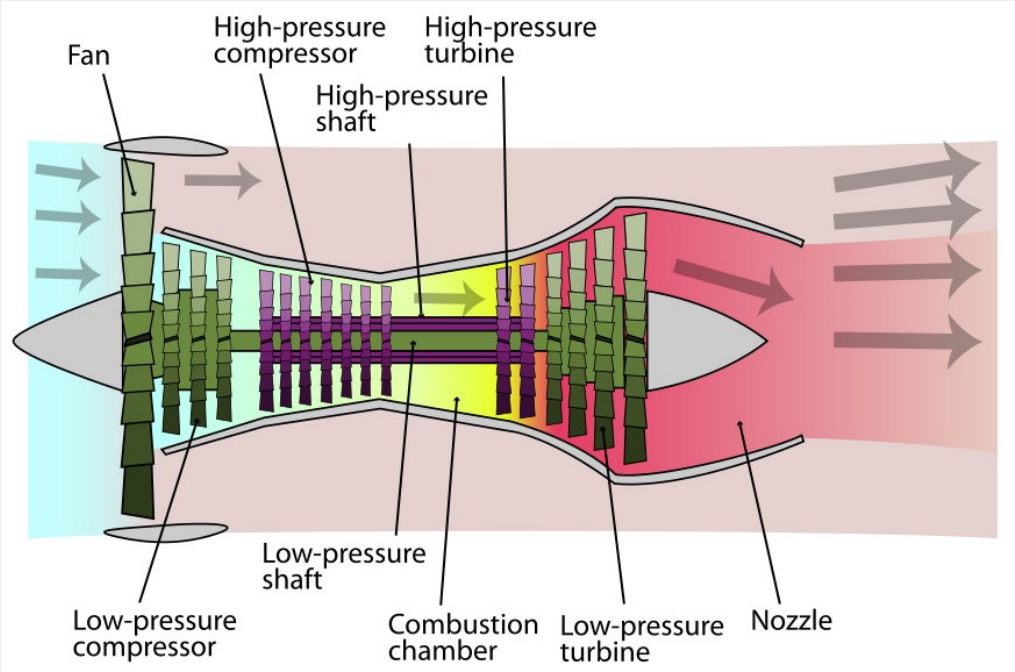

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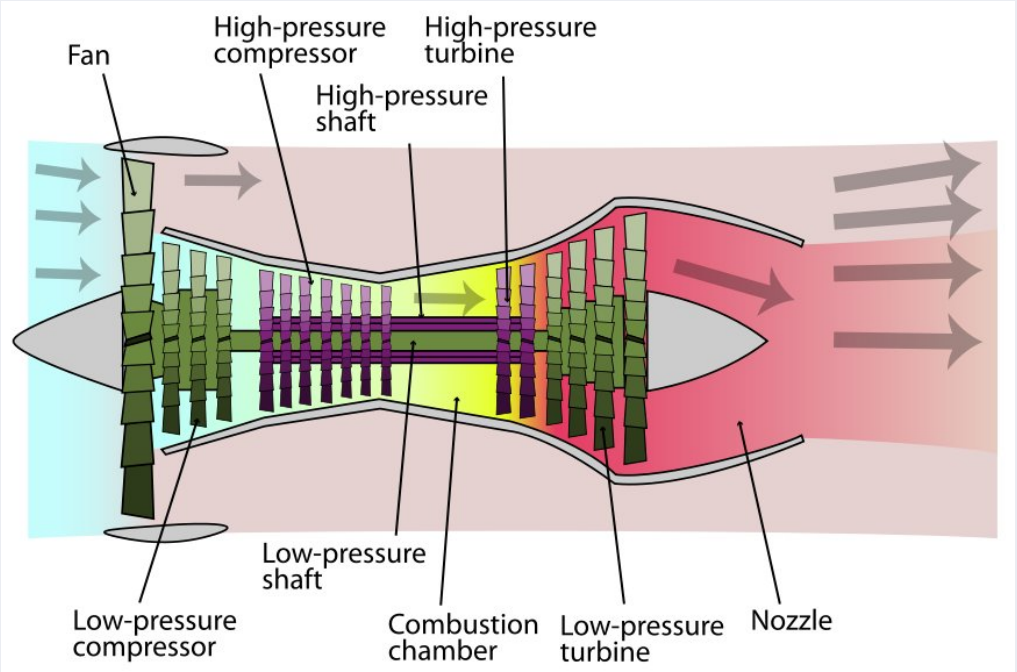

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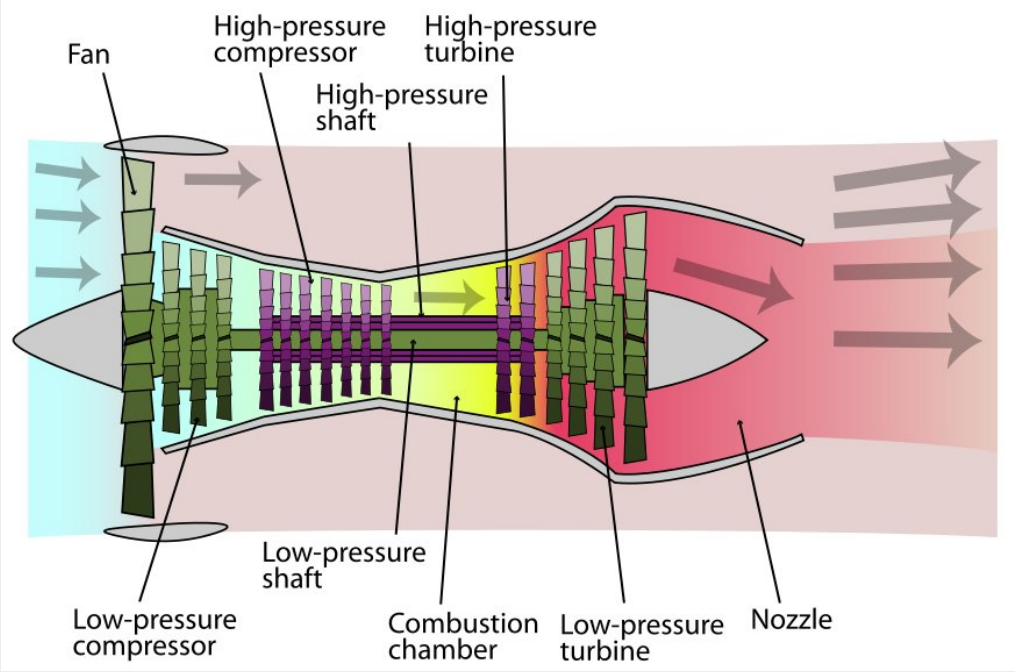

Combustor or Can or Flameholders or Combustion Chamber

a chamber where **fuel** is continuously **burned** in the **compressed air**

Turbine

produces energy which is used to drive the compressor

Exhaust or Nozzle

part of engine where hot gases leave the engine

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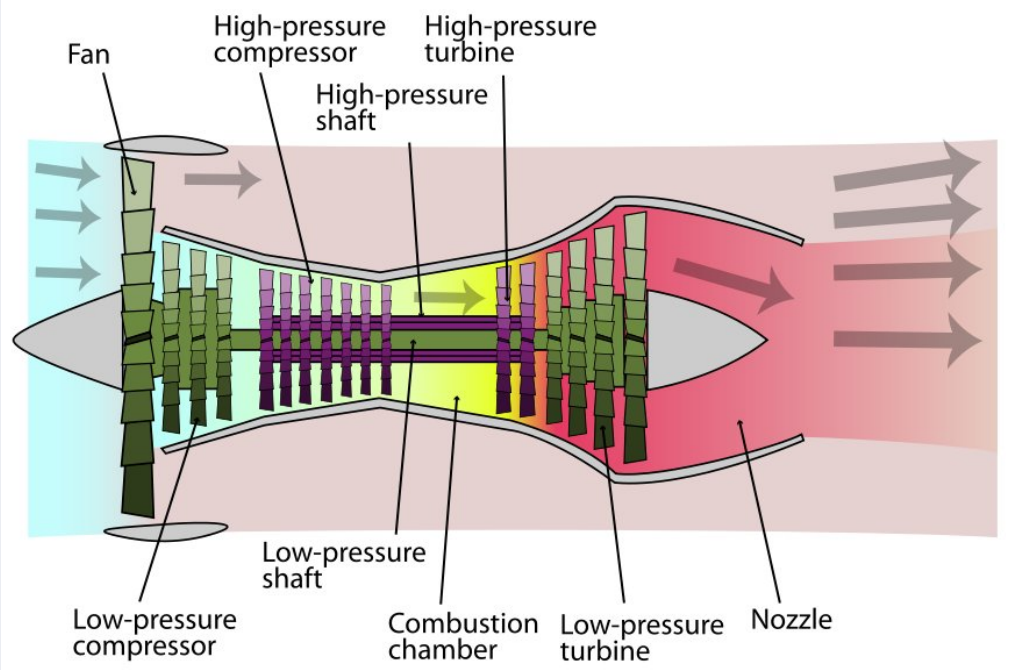

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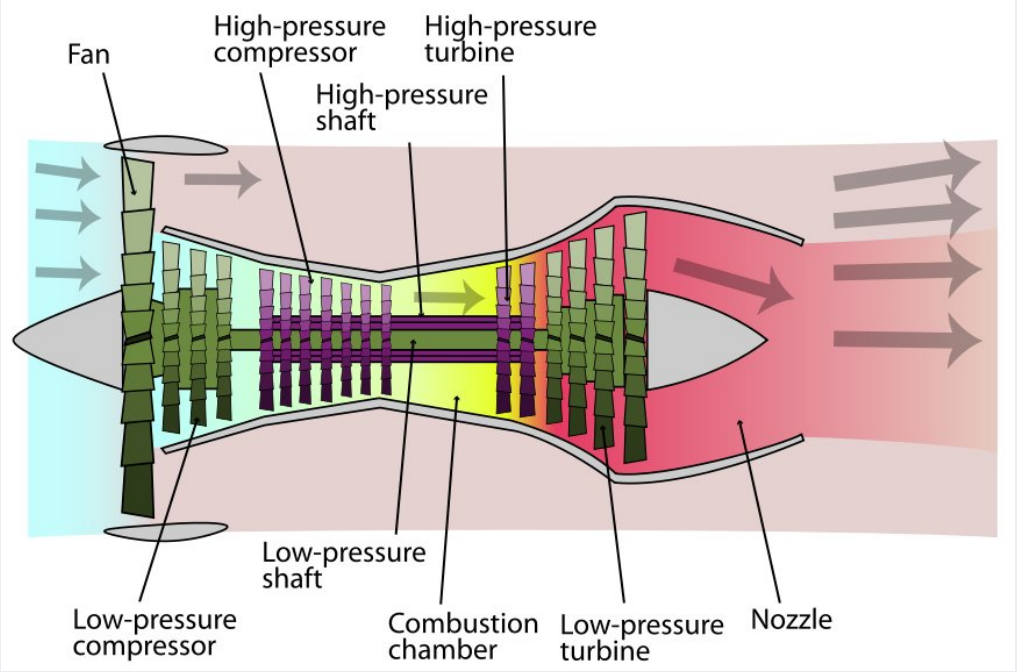

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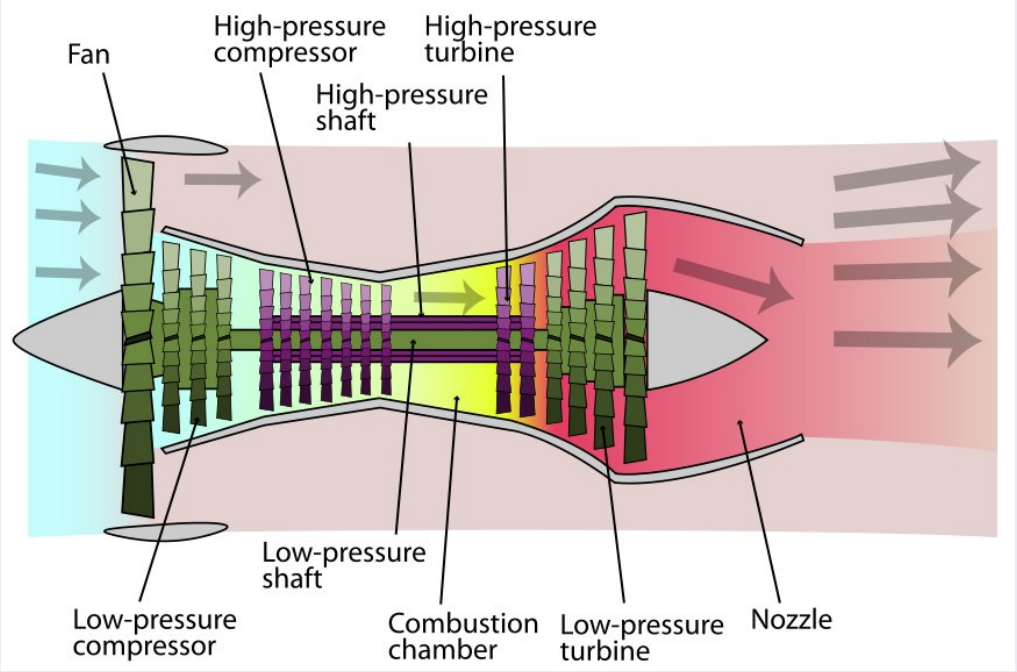

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advantages over traditional propeller planes

- jets can travel **much faster**
- jets can travel at **higher altitudes**
- flying higher allows jet planes to **avoid** the **turbulence** that occurs at lower altitudes
- allows air traffic patterns to **increase** the **number of planes** in the **sky** (they can operate at different altitudes)
- jets can use their greater power to **propel larger aircraft**

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