Module – 1

ANATOMY OF THE PLANE

Syllabus:

Anatomy of the Plane*:* Airplane Components, Flight Controls, Airplane Geometry, Quiz on Airplane Components.

5.1 Anatomy of the Plane

The airframe consists of five main groups of structural sub-assemblies, namely:

- **The fuselage**, i.e., the main body of the aircraft.
- **The wings**, which produce the lift on the aircraft.
- **The empennage**, which consists of horizontal and vertical stabilizers.
- **The flight control surfaces**, i.e., the ailerons, elevator, rudder, and flaps.
- **The undercarriage** or landing gear.

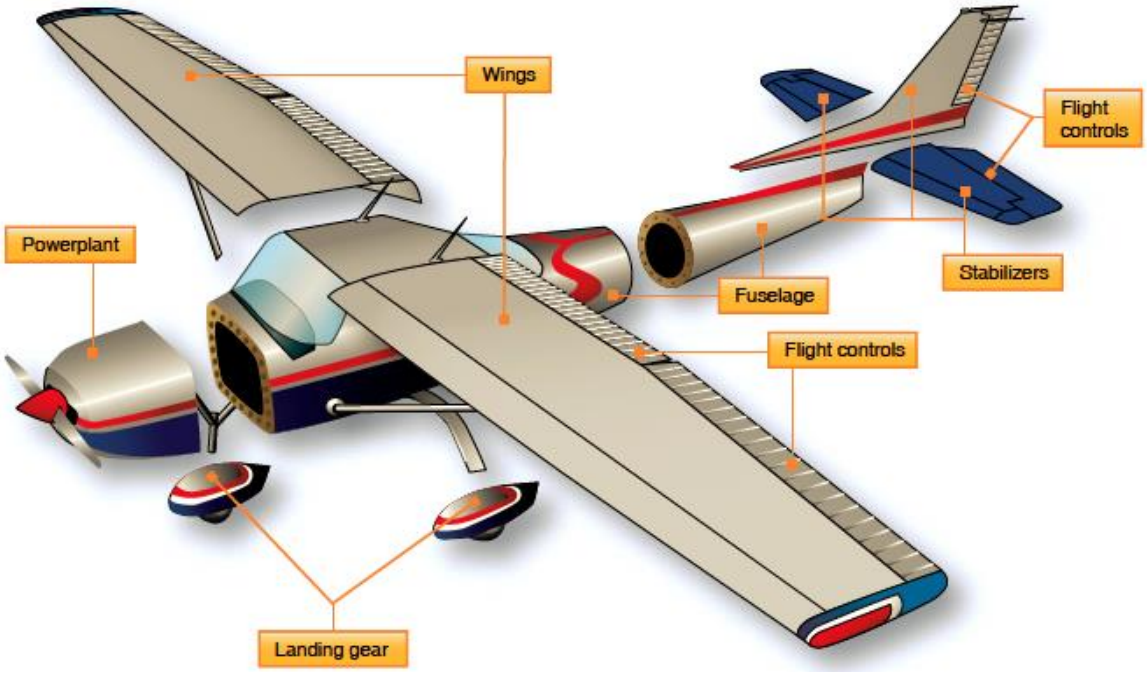


Fig: Anatomy of the Plane – Small General Aviation Plane

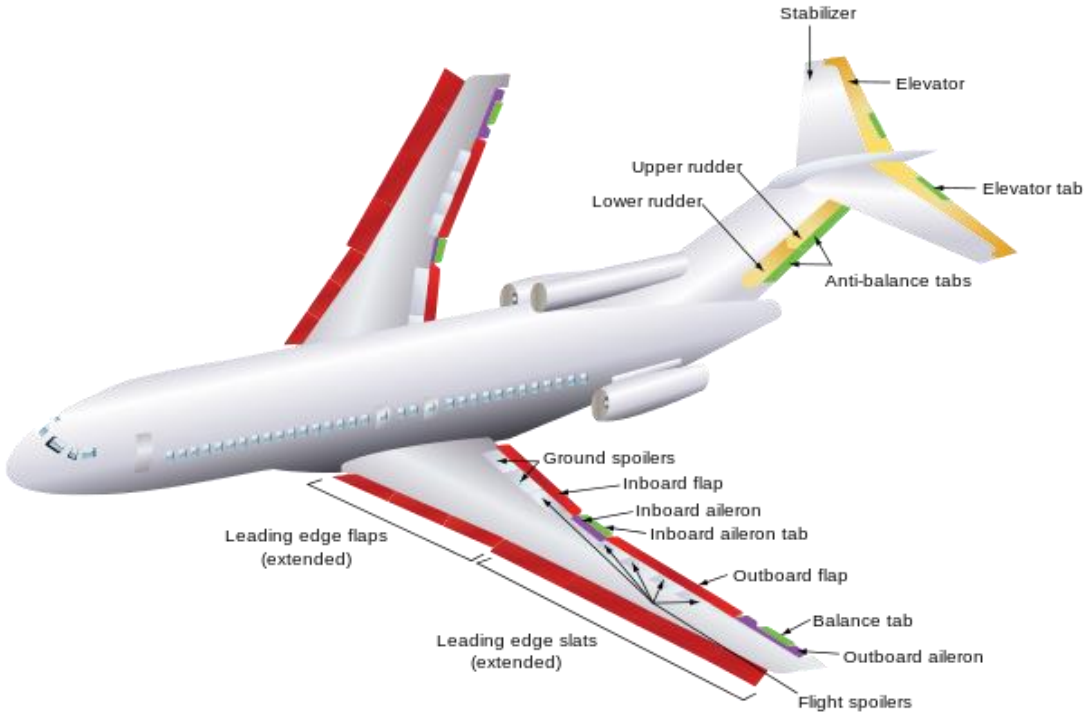
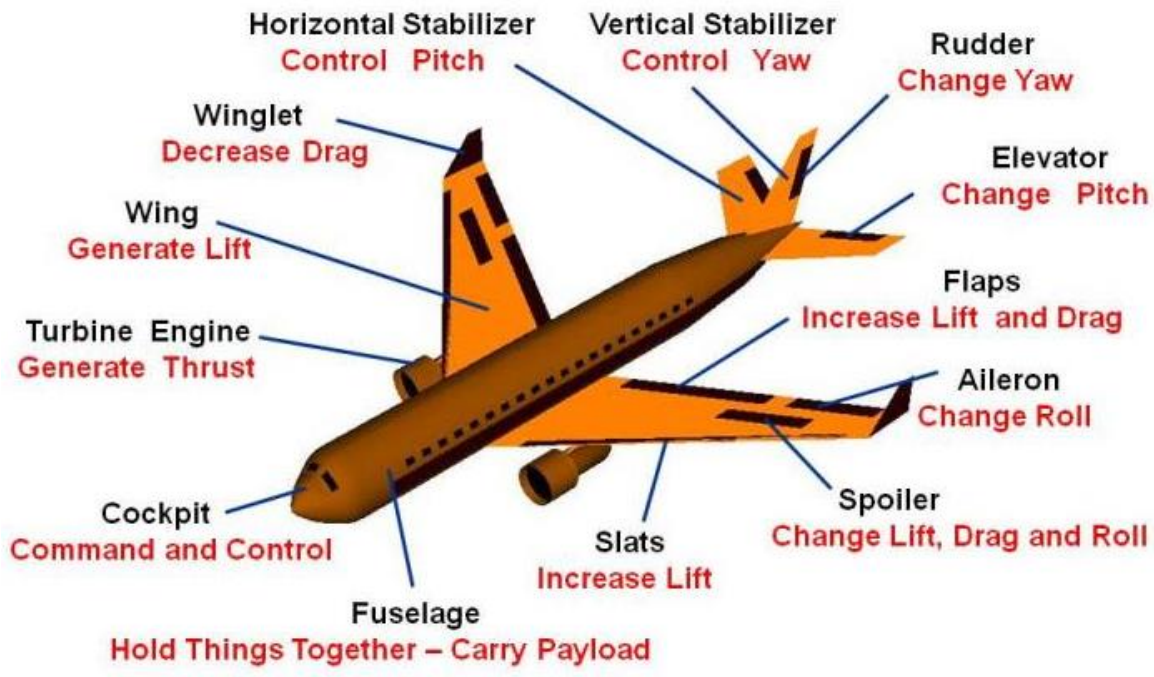


Fig: Anatomy of the Plane – Multiengine Commercial Airliner

5.2 Airplane Components



The **fuselage** is the center body, where most of the usable volume of the airplane is found. The fuselage carries people, baggage, other payload, instruments, fuel, and anything else that the airplane designer puts there.

The **wings** are the main lift-producing components of the airplanes; the left and right wings are identified as you would see them from inside the airplane, facing forward. The internal volume of the wings can be used for such items as fuel tanks and storage of the main landing gear (the wheels and supporting struts) after the gear is retracted.

The **horizontal and vertical stabilizers** are located and sized so as to provide the necessary stability for the airplane in flight. Sometimes these surfaces are called the horizontal and vertical tails, or fins.

When the **engines** are mounted from the wings, they are usually housed in a type of shroud called a nacelle.

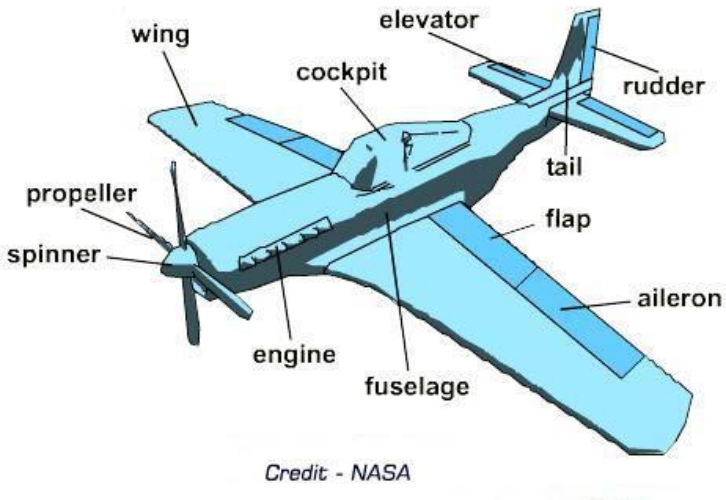
Flaps and control surfaces and these are hinged surfaces, usually at the trailing edge (the back edge) of the wings and tail that can be rotated up or down. The function of a flap is to increase the lift force on the airplane;

Some aircraft are designed with flaps at the leading edge **(Slats**) of the wings as well as at the trailing edge. Slats are used at takeoff and landing to produce additional force.

The **ailerons** are control surfaces that control the rolling motion of the airplane around the fuselage. For example, when the left aileron is deflected downward and the right aileron is deflected upward, lift is increased on the left wing and decreased on the right wing, causing the airplane to roll to the right.

The **elevators** are control surfaces that control the nose up-and-down pitching motion; when the elevator is deflected downward, the lift on the tail is increased, pulling the tail up and the nose of the airplane down.

The **rudder** is a control surface that can turn the nose of the airplane to the right or left (called yawing).



- Fuselage - The body of the airplane. The wings, tail, and engine are attached to the fuselage.
- Wing - It's the horizontal airfoil that produces lift. The ailerons and flaps are hinged to the wing.
- Ailerons - Hinged surfaces on the outside of the wing that swing up and down. While the right aileron hinges up, the left aileron hinges down. And vice versa. These surfaces control the roll of the airplane.
- Tail - The rear section of the plane that consists of a horizontal stabilizer and a vertical stabilizer. The elevator hinges to the horizontal stabilizer. The rudder hinges to the vertical stabilizer.
- Elevator - Hinged surfaces on the horizontal part of the tail that swings up and down. These surfaces control the pitch of the airplane.
- Rudder - Hinged surface on the vertical part of the tail that swings left and right. This surface controls the yaw of the airplane.
- Flaps - Hinged surfaces on the wing just inside the ailerons. The flaps hinge down to increase lift on takeoff and landing.
- Engine - Provides the power to turn the propeller to produce thrust for sustaining flight.
- Propeller - A turning blade or twisted airfoil that produces thrust when powered by the engine.
- Spinner - The nose cone that covers the hub of the propeller. Helps smooth the airflow over the engine. Is where you place the electric starter on an RC airplane.
- Cockpit - Where the pilot sits while flying the plane. Houses all the controls and instrumentation.

5.3 Flight Controls

Primary Flight Control Surfaces:

- The primary flight control surfaces on a fixed-wing aircraft include: ailerons, elevators, and the rudder.
- The ailerons are attached to the trailing edge of both wings and when moved, rotate the aircraft around the longitudinal axis.
- The elevator is attached to the trailing edge of the horizontal stabilizer. When it is moved, it alters aircraft pitch, which is the attitude about the horizontal or lateral axis.

- The rudder is hinged to the trailing edge of the vertical stabilizer. When the rudder changes position, the aircraft rotates about the vertical axis (yaw).

Secondary Control Surfaces:

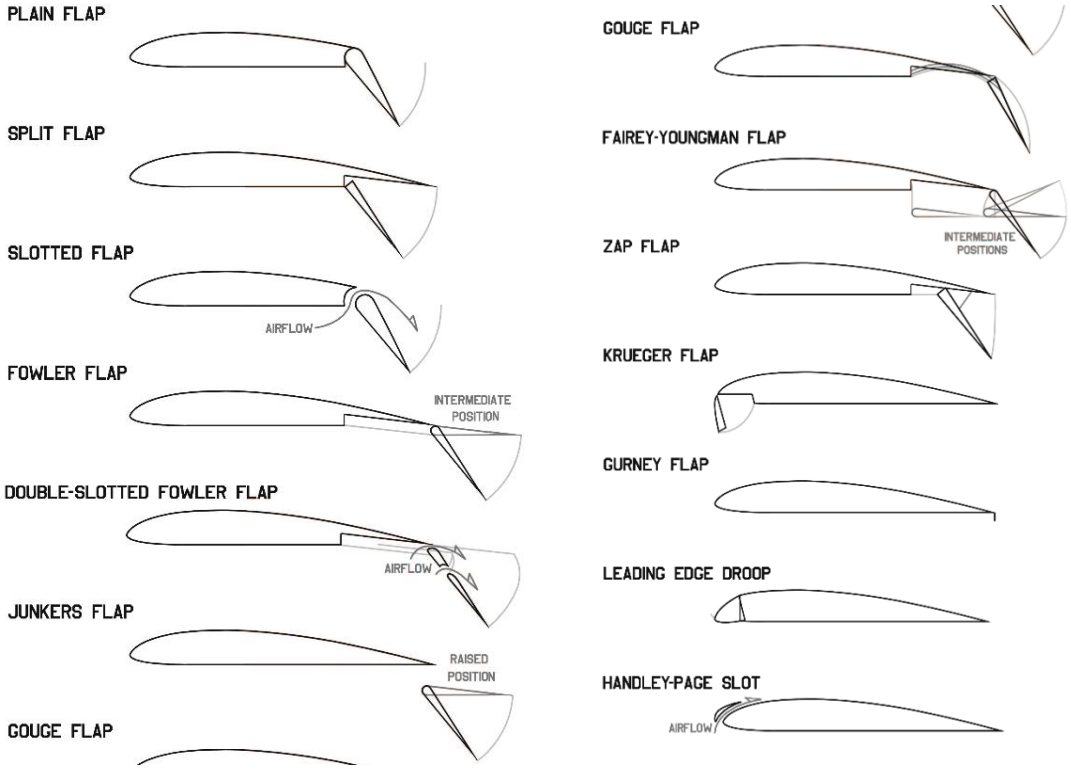
- Trim tabs are small surfaces connected to the trailing edge of a larger control surface on an aircraft, used to control the trim of the controls, i.e. to counteract hydro- or aerodynamic forces and stabilize the aircraft in a particular desired attitude without the need for the operator to constantly apply a control force. This is done by adjusting the angle of the tab relative to the larger surface.
- A servo tab is a small hinged device installed on an aircraft control surface to assist the movement of the control surfaces.

Auxiliary Control Surfaces:

- Flaps and control surfaces and these are hinged surfaces, usually at the trailing edge (the back edge) of the wings and tail that can be rotated up or down. The function of a flap is to increase the lift force on the airplane;
- Some aircraft are designed with flaps at the leading edge (Slats) of the wings as well as at the trailing edge. Slats are used at takeoff and landing to produce additional force.
- The spoilers are also used during landing to slow the plane down and to counteract the flaps when the aircraft is on the ground. The next time you fly on an airplane, notice how the wing shape changes during takeoff and landing.

High Lift Devices:

There are many different types of flaps depending on the size, speed, and complexity of the aircraft they are to be used on, as well as the era in which the aircraft was designed. Plain flaps, slotted flaps, and Fowler flaps are the most common trailing edge flaps. Flaps used on the leading edge of the wings of many jet airliners are Krueger flaps, slats, and slots (Notice that slots are not explicitly flaps, but more precisely boundary layer control devices).



The plain flap is the simplest flap and it is used in light. The basic idea is to design the airfoil so that the trailing edge can rotate around an axis. The angle of that deflection is the flap deflection δf . The effect is an increase in the camber of the airfoil, resulting in an increase in the coefficient of lift.

Another kind of trailing edge high-lift device is the slotted flap. The only difference with the plain flap is that it includes a slot which allows the extrados and intrados to be communicated. By this mean, the flap deflection is higher without the boundary layer dropping off.

The last basic trailing edge high-lift device is the flap Fowler. This kind of flap combines the increase of camber with the increase in the chord of the airfoil (and therefore the wet surface). This fact increases also the slope of the lift curve. Combining the different

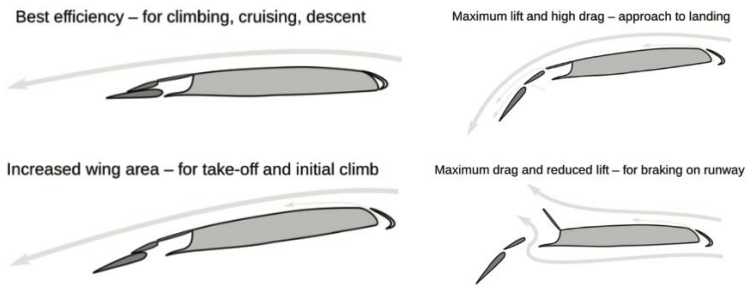
types, there exist double and triple slotted Fowler flaps, combining also the control of the boundary layer. The Fairey-Youngman, Gouge, and Junkers flaps combine some of the exposed properties.

The last trailing edge high-lift device is the split flap (also refereed to as intrados flap). This flap provides, for the same increase of lift coefficient, more drag but with less torque.

The most important leading edge high devices are: slot, the leading edge drop flap, and the flap Krueger.

The slot is a slot in the leading edge. It avoid the dropping off of the boundary layer by communicating extrados and intrados. The leading edge drop has the same philosophy as the plain flap, but applied in the leading edge instead of the trailing edge. The Kruger flaps works modifying the camber of the airfoil but also acting in the control of the boundary layer.

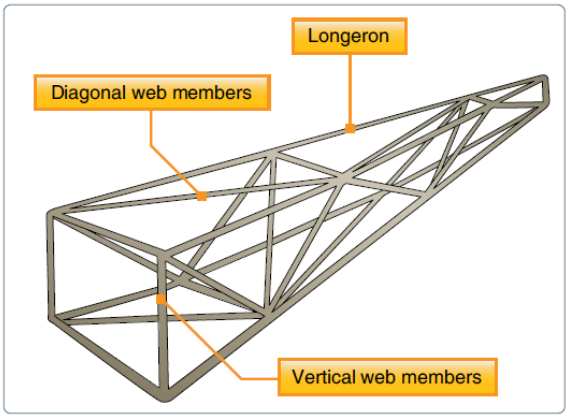
Effects of high lift devices in airfoil flow, showing configurations for normal, take-off, landing, and braking:



5.3 Airplane Geometry

5.3.1 Types of Fuselage Structures / Types Aircraft Constructions

Truss or framework Type:



- A truss is a rigid framework made up of members, such as beams, struts, and bars to resist deformation by applied loads. The truss-framed fuselage is generally covered with fabric.
- This consists of light gauge steel tubes which form a frame triangular shape to give the most rigid of geometric forms. Each tube carries a specific load, the magnitude of which depends on whether the aircraft is airborne or on the ground.
- The truss-type fuselage frame is usually constructed of steel tubing welded together in such a manner that all members of the truss can carry both tension and compression loads.
- This type of fuselage is commonly found on the first few generations of aircraft. They are strong, moderately easy to manufacture, but did not necessarily implement the concept of aerodynamic.

Monocoque Construction:

- 'Monocoque' is a French word meaning 'single shell'. All the loads are taken by a stressed skin with just light internal frames or formers to give the required shape. Monocoque structure was the improved version of truss structure.
- It provides the close structure by covering the entire body by sheet of metal and achieves the smooth flow of air that reduces the drag.
- Since it is basically egg shell like structure, most of the strength is provided by skin (sheet of metal). As the results it increases the internal space.
- Although it practically can carry more load, the drawback of this type is that it may require maintenance more compared to the other designs, as the structure needs to be reinforced in order to maintain the structural integrity.

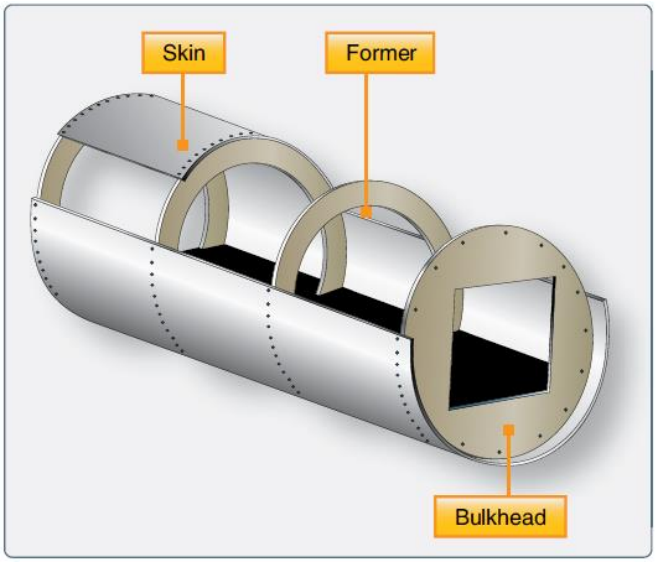


Figure 1-16. *An airframe using monocoque construction.*

Semi-Monocoque Construction:

- As aircraft became larger, the pure Monocoque was found not to be strong enough.
- Designers came with a new concept to make fuselage stronger; the Longerons run lengthwise along the fuselage joining the frames together.
- The light alloy skin is attached to the frames and longerons by riveting or adhesive bonding.
- Doublers are required when cut-outs are made to provide access panels, doors or windows.
- Bulkheads isolate different sections of the aircraft, for instance the engine compartment from the passenger compartment. Bulkheads are of much stronger construction than frames or formers, as the loads upon them are so much greater.
- This concept is widely used both in military and also in the commercial industry.

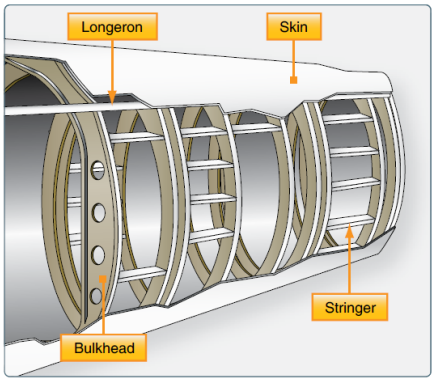
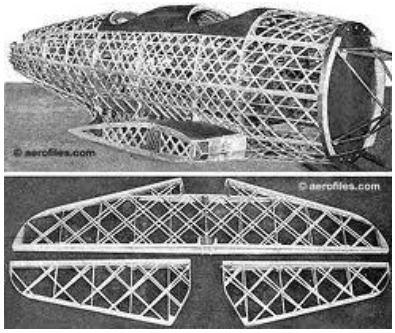


Figure 1-17. *The most common airframe construction is semimonocoque.*

Geodesic Construction:

- It is the very recent approach of building the structure adopted in the fighter jets.
- Here the structure is divided into small panel like structure and each panel is strengthen by the separate structural members, so the each panel is independent of taking load and not depends upon the neighboring panel to take its load.
- Now even though one panel fails or broken also it does not affect the entire structure.



5.3.2 Wing Structure/Construction

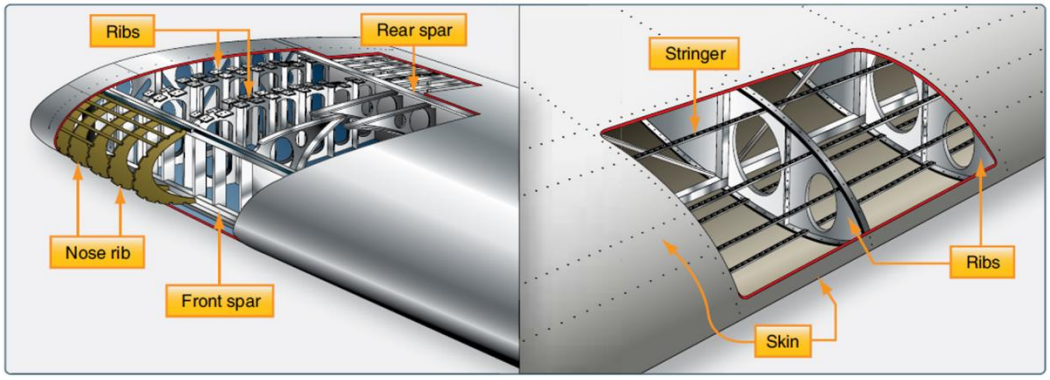
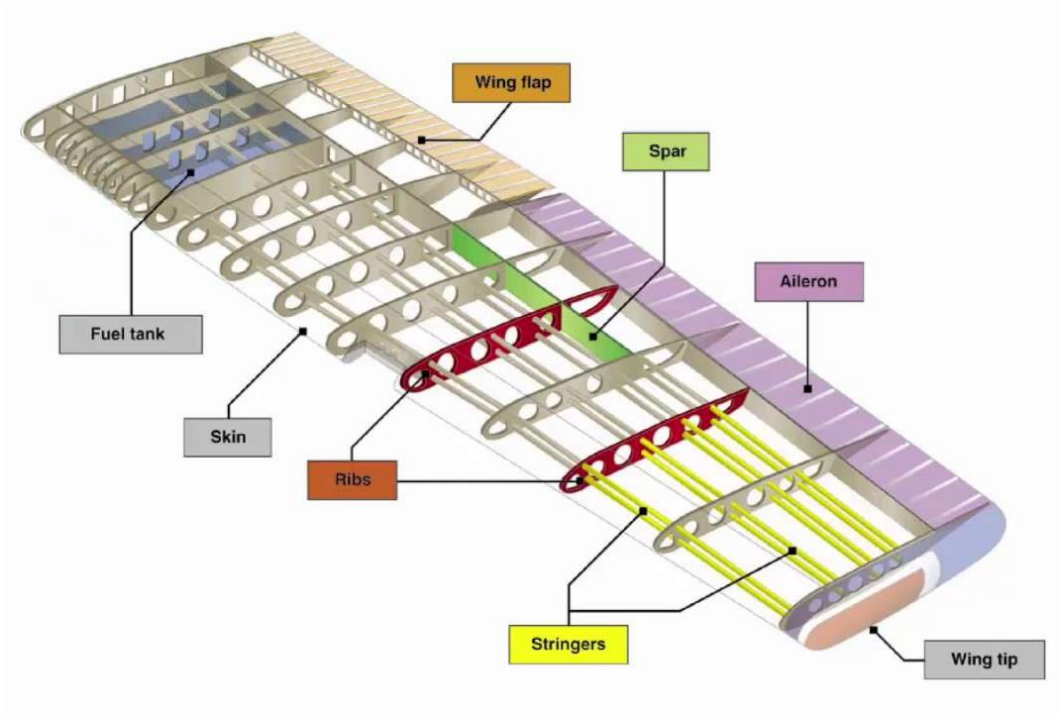


Figure 1-23. *Wing structure nomenclature.*

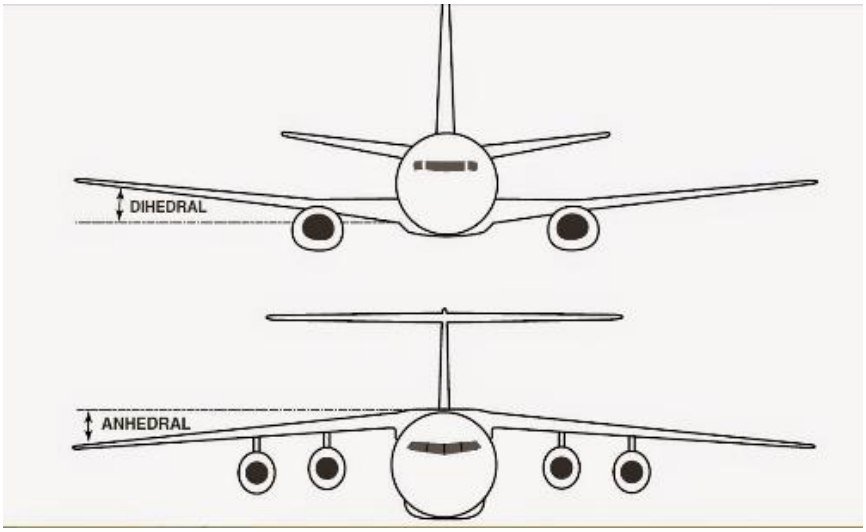


The wing is the principal structural unit of the airplane. It has several functions beyond that of providing lift. For a wing to produce "lift", it must be oriented at a suitable angle of attack relative to the flow of air past the wing. In aerodynamics, angle of attack (AOA) specifies the angle between the chord line of the wing of a fixed-wing aircraft and the vector representing the relative motion between the aircraft and the atmosphere.

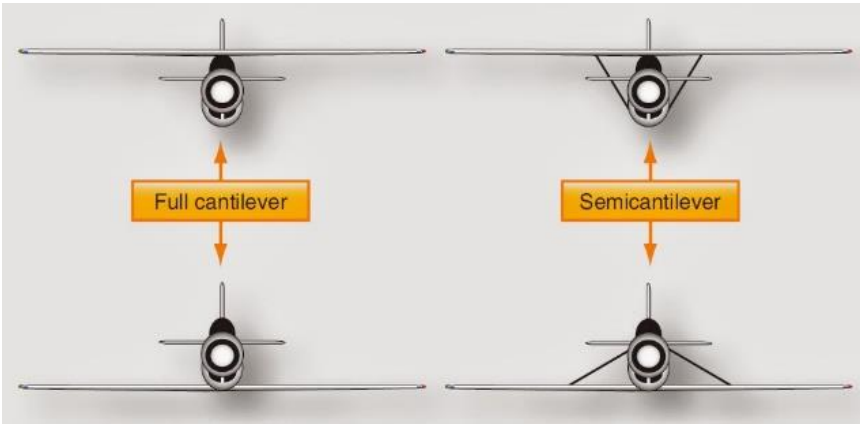
On larger airplanes the engines are mounted in nacelles either attached to the wing or mounted in the wing. The nacelles also provide a housing for the landing gear when it is retracted. The space within the wing is usually used for fuel storage.

The main geometrical features of a wing are its span; the area of the wing; its dihedral angle; its sweepback angle; and the wing section.

Dihedral angle is the upward angle of an aircraft's wing, from the wing root to the wing tip. The amount of dihedral determines the amount of inherent stability along the roll axis. Although an increase of dihedral will increase inherent stability, it will also decrease lift, and increase drag.



The design of the wing depends on the size, weight, and use of the airplane. Generally, there are two kinds of wing design: cantilever and semi-cantilever. The semi-cantilever usually has one, or perhaps two, supporting wires or struts attached to each wing and the fuselage.



As far as the internal structure is concerned, there are three general types of conventional wings: monospar, two-spar, and multispar. Stringers are longitudinal members which are attached to the upper and lower skin to make it stiff. They are used in the design of a wing with stressed skin. Ribs are the basic elements of the wing structure which give the wing section its shape and also transmit the air loads from the skin to the spars.

Many of the control functions are provided by special devices built into the wing. Most obvious are the ailerons and landing flaps.

Flaps are high lift devices. There are many different types of flaps used, with the specific choice depending on the size, speed and complexity of the aircraft on which they are to be used, as well as the era in which the aircraft was designed. Plain flaps, slotted flaps, and Fowler flaps are the most common. Krueger flaps are positioned on the leading edge of the wings and are used on many jet airliners.

The leading edge is the part of the wing that first contacts the air. The leading edge may be equipped with e.g. leading edge extensions, leading edge slats, leading edge slots, vortex generators.

The trailing edge of an aerodynamic surface such as a wing is its rear edge, where the airflow separated by the leading edge rejoins. Essential control surfaces are attached here to redirect the air flow and exert a controlling force by changing its momentum. Such control surfaces include ailerons on the wings for roll control, elevators on the tailplane controlling pitch and the rudder on the fin controlling yaw. Elevators and ailerons may be combined as elevons on tailless aircraft.

Other surfaces and equipment that may be attached to the trailing edge of an aircraft's wing or on its control surfaces include: trim tabs, servo tabs, anti-servo tabs, and flaps.

5.3.3 Wing Configuration

Wings are airfoils that, when moved rapidly through the air, create lift. They are built in many shapes and sizes. Wing design can vary to provide certain desirable flight characteristics. Control at various operating speeds, the amount of lift generated, balance, and stability all change as the shape of the wing is altered. Both the leading edge and the trailing edge of the wing may be straight or curved, or one edge may be straight and the other curved. One or both edges may be tapered so that the wing is narrower at the tip than at the root where it joins the fuselage. The wing tip may be square, rounded, or even pointed. Below figure shows a number of typical wing leading and trailing edge shapes.

The wings of an aircraft can be attached to the fuselage at the top, mid-fuselage, or at the bottom. They may extend perpendicular to the horizontal plain of the fuselage or can angle up or down slightly. This angle is known as the wing dihedral. The dihedral angle affects the lateral stability of the aircraft. Below figure shows some common wing attach points and dihedral angle.

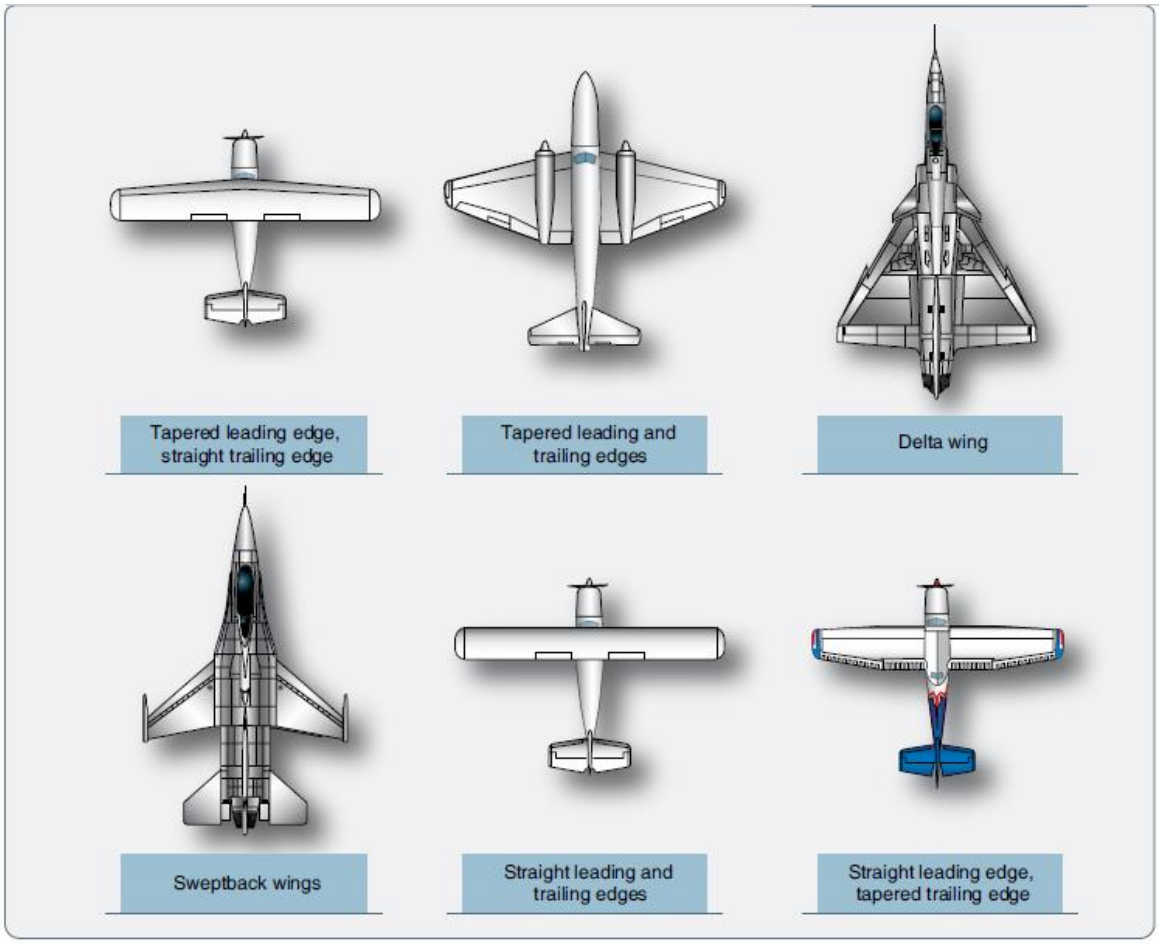


Figure 1-19. *Various wing design shapes yield different performance.*

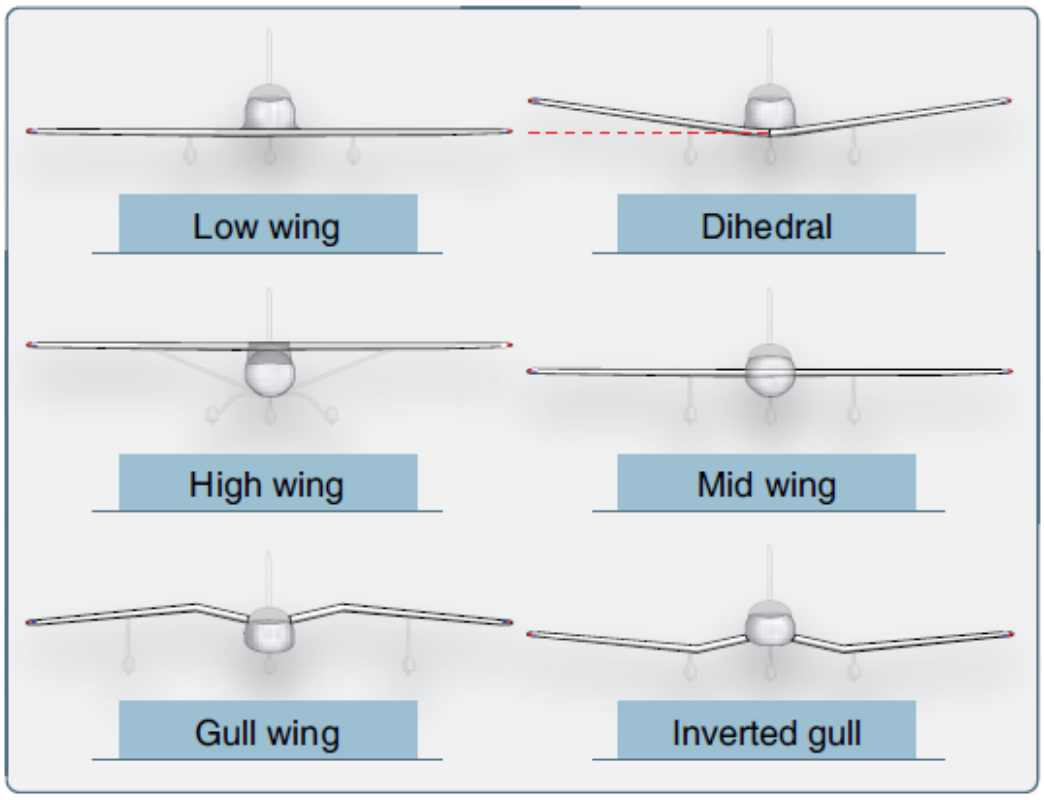
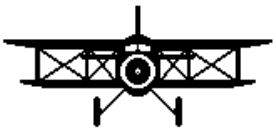


Figure 1-20. *Wing attach points and wing dihedrals.*

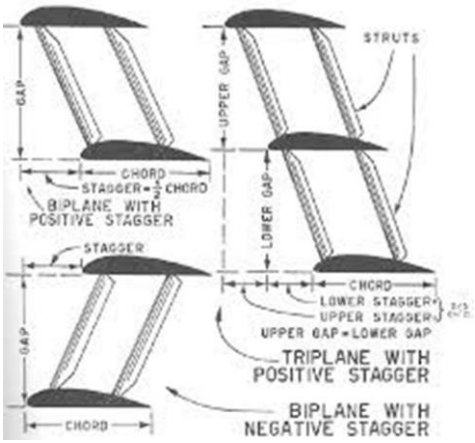
Biplane:



BIPLANE

In a biplane aircraft, as two wings are placed one above the other. Both provide part of the lift, although they are not able to produce twice as much lift as a single wing of similar size and shape because the upper and the lower are working on nearly the same portion of the atmosphere and thus interfere with each other's behavior.

Stagger:



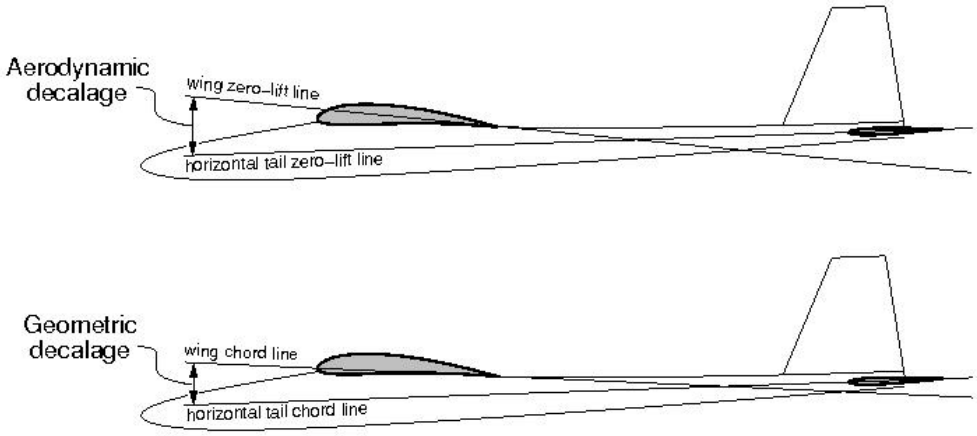
- Stagger is the horizontal positioning of a biplane, triplane, or multiplane's wings in relation to one another.
- An aircraft is said to have positive stagger, or simply stagger, when the upper wing is positioned forward of the lower (bottom).
- An aeroplane is said to have negative stagger in unusual cases where the upper wing is positioned behind the lower wing.
- An aircraft with the wings positioned directly above each other is said to have unstaggered wings.

Decalage:

- Decalage on a fixed-wing aircraft is the angle difference between the upper and lower wings of a biplane, i.e. the acute angle contained between the chords of the wings in question.
- The decalage is said to be positive when the upper wing has a higher angle of incidence than the lower wing, and negative when its angle of incidence is lower.

Positive decalage results in greater lift from the upper wing than the lower wing, the difference increasing with the amount of decalage.

- Decalage angle can also refer to the difference in angle of the chord line of the wing and the chord line of the horizontal stabilizer.



Monoplane:

MONOPLANE

A monoplane is a fixed-wing aircraft with one main set of wing surfaces, in contrast to a biplane or triplane. Since the late 1930s it has been the most common form for a fixed-wing aircraft.

MCQs: Module - 1

1. The yoke is acting on:

a. The ailerons and the elevator.

b. The ailerons and the rudder.

c. The flaps and the rudder.

d. None of the above.

2. With his feet, the pilot is acting on:

a. The rudder.

b. The elevator.

c. The flaps.

d. None of the above

3. The longitudinal trim tab allows:

a. To adjust the balanced position of the elevator.

b. To increase the deflection of the elevator.

c. To freeze the elevator in case of emergency.

d. None of the above

4. Flaps are high lift devices located:

a. Close to the wingtip, at the trailing edge.

b. At the trailing edge, between fuselage and ailerons.

c. At the leading edge, close to the wingtip.

d. At the leading edge on the wing undersurface.

5. Among the following elements, what are those whose area contributes to the airplane reference area?

a. The right wing

b. The horizontal tailplane

c. The fin

d. The fuselage section between left and right wing

6. The rudder control surface is controlled by the pilot:

a. By pulling or pushing the yoke or the stick.

b. By turning the yoke or the stick.

c. By pushing on the rudder pedals.

d. None of the above

7. An airplane presents a symmetry plane:

a. Vertical, along the fuselage axis.

b. Horizontal, along the fuselage axis.

c. Vertical, along the span of the wing.

d. None of the above

8. The span is:

a. The length of the wing divided by its area.

b. The sum of the length of each half wing.

c. The distance from the left wing tip to the right wing tip.

d. None of the above

9. Which component generates lift on an aircraft?

a. Rudder

b. Wing

c. Fuselage

d. Flap

10. What is the primary purpose of an aircraft's fuselage?

a. To generate lift

b. To provide stability

c. To house passengers and cargo

d. To control the aircraft's direction

11. Which component controls the aircraft's pitch?

a. Aileron

b. Flap

c. Rudder

d. Elevator

12. What is the purpose of an aircraft's empennage?

a. To house the engines

b. To stabilize the aircraft in flight

c. To provide lift

d. To control the aircraft's speed

13. Which component controls the aircraft's yaw?

a. Flap

b. Rudder

c. Elevator

d. Aileron

14. What is the function of an aircraft's ailerons?

a. To control the aircraft's speed

b. To stabilize the aircraft in flight

c. To control the aircraft's roll

d. To provide additional lift

15. Which component is responsible for changing the direction of airflow over the wings?

a. Flap

b. Aileron

c. Spoiler

d. Elevator

16. What is the primary purpose of an aircraft's landing gear?

a. To generate lift

b. To provide stability

c. To control the aircraft's direction

d. To support the aircraft on the ground

17. Which component is used to slow down or stop an aircraft after landing?

a. Spoiler

b. Rudder

c. Flap

d. Brakes

18. What is the purpose of an aircraft's spoilers?

a. To generate lift

b. To provide stability

c. To control the aircraft's direction

d. To reduce lift and increase drag

19. Which component is responsible for providing power to propel the aircraft forward?

a. Wing

b. Fuselage

c. Propeller

d. Aileron

20. What is the purpose of an aircraft's flaps?

a. To control the aircraft's speed

b. To provide stability

c. To generate lift

d. To control the aircraft's direction

21. Which component is responsible for controlling the aircraft's roll?

a. Elevator

b. Rudder

c. Aileron

d. Spoiler

22. What is the function of an aircraft's slats?

a. To control the aircraft's roll

b. To provide stability

c. To generate lift at low speeds

d. To control the aircraft's speed

23. Which component is responsible for controlling the aircraft's banking motion?

a. Rudder

b. Aileron

c. Flap

d. Elevator

24. What is the purpose of an aircraft's trim tabs?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To balance the control surfaces

25. Which component is responsible for controlling the aircraft's lateral movement?

a. Rudder

b. Flap

c. Elevator

d. Aileron

26. What is the function of an aircraft's airspeed indicator?

a. To measure the aircraft's altitude

b. To measure the aircraft's speed

c. To measure the aircraft's fuel level

d. To measure the aircraft's angle of attack

27. Which component is responsible for generating electrical power on an aircraft?

a. Generator

b. Battery

c. Alternator

d. Motor

28. What is the purpose of an aircraft's pitot tube?

a. To measure the aircraft's altitude

b. To measure the aircraft's speed

c. To measure the aircraft's fuel level

d. To measure the aircraft's angle of attack

29. Which component is responsible for measuring the aircraft's altitude?

a. Airspeed indicator

b. Altimeter

c. Turn and slip indicator

d. Vertical speed indicator

30. What is the purpose of an aircraft's attitude indicator?

a. To measure the aircraft's altitude

b. To measure the aircraft's speed

c. To measure the aircraft's fuel level

d. To indicate the aircraft's orientation relative to the horizon

31. Which component is responsible for measuring the rate of climb or descent of an aircraft?

a. Airspeed indicator

b. Altimeter

c. Turn and slip indicator

d. Vertical speed indicator

32. What is the purpose of an aircraft's magnetic compass?

a. To measure the aircraft's altitude

b. To measure the aircraft's speed

c. To measure the aircraft's heading

d. To measure the aircraft's rate of turn

33. Which component is responsible for measuring the aircraft's rate of turn?

a. Airspeed indicator

b. Altimeter

c. Turn and slip indicator

d. Vertical speed indicator

34. What is the purpose of an aircraft's fuel system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To store and distribute fuel to the engines

35. Which component is responsible for storing fuel on an aircraft?

a. Fuel pump

b. Fuel tank

c. Fuel filter

d. Fuel nozzle

36. What is the purpose of an aircraft's hydraulic system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To transmit and control hydraulic power for various aircraft functions

37. Which component is responsible for converting mechanical power into hydraulic power in an aircraft?

a. Hydraulic reservoir

b. Hydraulic pump

c. Hydraulic actuator

d. Hydraulic filter

38. What is the function of an aircraft's hydraulic actuator?

a. To store hydraulic fluid

b. To filter hydraulic fluid

c. To transmit hydraulic power to control surfaces or other systems

d. To regulate hydraulic pressure

39. Which component is responsible for controlling the flow of hydraulic fluid in an aircraft's hydraulic system?

a. Hydraulic reservoir

b. Hydraulic pump

c. Hydraulic actuator

d. Hydraulic valve

40. What is the purpose of an aircraft's electrical system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To supply electrical power to various aircraft systems and equipment

41. Which component is responsible for converting mechanical power into electrical power on an aircraft?

a. Alternator

b. Generator

c. Battery

d. Motor

42. What is the function of an aircraft's circuit breaker?

a. To regulate the flow of electrical current

b. To protect electrical circuits from overload or short circuit

c. To store electrical energy

d. To control the distribution of electrical power

43. Which component is responsible for distributing electrical power to various systems and equipment on an aircraft?

a. Alternator

b. Generator

c. Battery

d. Bus bar

44. What is the purpose of an aircraft's avionics system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To provide communication, navigation, and other electronic functions in an aircraft

45. Which component is responsible for transmitting and receiving radio signals in an aircraft's communication system?

a. Transponder

b. Antenna

c. Receiver

d. Amplifier

46. What is the function of an aircraft's transponder?

a. To generate lift

b. To provide stability

c. To control the aircraft's speed

d. To reply to radar signals with encoded information

47. Which component is responsible for providing weather information to the pilot?

a. Transponder

b. Radar

c. GPS receiver

d. Weather radar

48. What is the purpose of an aircraft's autopilot system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To automatically control the aircraft's flight path

49. Which component is responsible for measuring the aircraft's position, velocity, and time in an aircraft's navigation system?

a. Transponder

b. Radar

c. GPS receiver

d. Weather radar

50. What is the function of an aircraft's radar system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To detect and track objects in the aircraft's vicinity

51. Which component is responsible for measuring the distance to objects in an aircraft's radar system?

a. Transponder

b. Radar antenna

c. Receiver

d. Amplifier

52. What is the purpose of an aircraft's air conditioning system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To maintain a comfortable temperature and air quality in the aircraft cabin

53. Which component is responsible for cooling the air in an aircraft's air conditioning system?

a. Compressor

b. Condenser

c. Evaporator

d. Expansion valve

54. What is the function of an aircraft's anti-icing system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To prevent ice buildup on the aircraft's surfaces

55. Which component is responsible for heating the aircraft's surfaces in an anti-icing system?

a. Heater

b. Heater control valve

c. Heat exchanger

d. Bleed air duct

56. What is the purpose of an aircraft's fire detection and suppression system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To detect and suppress fires in the aircraft

57. Which component is responsible for detecting smoke / fire in an aircraft's fire detection?

a. Smoke detector

b. Fire extinguisher

c. Fire detector

d. Fire control panel

58. What is the function of an aircraft's oxygen system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To supply oxygen to the crew and passengers at high altitudes

59. Which component is responsible for storing and distributing oxygen in an aircraft's oxygen system?

a. Oxygen generator

b. Oxygen cylinder

c. Oxygen regulator

d. Oxygen mask

60. What is the purpose of an aircraft's deicing system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To remove ice or snow from the aircraft's surfaces

61. Which component is responsible for distributing deicing fluid onto the aircraft's surfaces in a deicing system?

a. Deicing fluid tank

b. Deicing pump

c. Deicing nozzle

d. Deicing control panel

62. What is the function of an aircraft's navigation lights?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To indicate the aircraft's position and direction to other aircraft

63. Which component is responsible for providing light in an aircraft's navigation lights?

a. LED (Light-Emitting Diode)

b. Incandescent bulb

c. Halogen bulb

d. Fluorescent bulb

64. What is the purpose of an aircraft's anti-skid system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To prevent the aircraft's wheels from locking up during braking

65. Which component is responsible for modulating the braking pressure in an aircraft's anti-skid system?

a. Brake pedal

b. Brake lines

c. Anti-skid control unit

d. Brake disc

66. What is the function of an aircraft's stall warning system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To warn the pilot of an impending aerodynamic stall

67. Which component is responsible for providing a visual or audible warning in an aircraft's stall warning system?

a. Stall warning horn

b. Stall warning vane

c. Stall warning light

d. Stall warning computer

68. What is the purpose of an aircraft's thrust reverser system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To redirect engine thrust forward for deceleration after landing

69. Which component is responsible for reversing the direction of engine thrust in an aircraft's thrust reverser system?

a. Thrust reverser actuator

b. Thrust reverser bucket

c. Thrust reverser door

d. Thrust reverser control lever

70. What is the function of an aircraft's flight control system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To control the aircraft's attitude, altitude, and direction of flight

71. Which component is responsible for transmitting pilot inputs to the aircraft's control surfaces in a fly-by-wire flight control system?

a. Control yoke

b. Control column

c. Flight control computer

d. Control rod

72. What is the purpose of an aircraft's yaw damper system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To dampen yawing motions and improve directional stability

73. Which component is responsible for applying corrective rudder inputs in an aircraft's yaw damper system?

a. Yaw damper actuator

b. Yaw damper sensor

c. Yaw damper control unit

d. Rudder pedal

74. What is the function of an aircraft's landing gear system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To support the aircraft during takeoff, landing, and ground operations

75. Which component is responsible for retracting and extending the landing gear in an aircraft's landing gear system?

a. Landing gear strut

b. Landing gear door

c. Landing gear actuator

d. Landing gear control lever

76. What is the purpose of an aircraft's flaps?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To increase the aircraft's lift during takeoff and landing

77. Which component is responsible for extending and retracting the flaps?

a. Flap actuator

b. Flap track

c. Flap motor

d. Flap control lever

78. What is the function of an aircraft's spoiler system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To reduce lift and increase drag during landing and certain flight conditions

79. Which component is responsible for deploying and retracting the spoilers in an aircraft's spoiler system?

a. Spoiler actuator

b. Spoiler panel

c. Spoiler motor

d. Spoiler control lever

80. What is the purpose of an aircraft's thrust control system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To regulate engine thrust for different flight phases and conditions

81. Which component is responsible for adjusting the engine's thrust output in an aircraft's thrust control system?

a. Thrust lever

b. Thrust reverser

c. Thrust control computer

d. Thrust control valve

82. What is the function of an aircraft's trim system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To adjust the aircraft's control surfaces for aerodynamic balance

83. Which component is responsible for adjusting the trim settings in an aircraft's trim system?

a. Trim tab

b. Trim actuator

c. Trim wheel

d. Trim control lever

84. What is the purpose of an aircraft's fuel pump?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To deliver fuel from the fuel tank to the engine

85. Which component is responsible for pressurizing the fuel system and delivering fuel to the engine in an aircraft's fuel pump?

a. Fuel tank

b. Fuel pump motor

c. Fuel pump impeller

d. Fuel pump control unit

86. What is the function of an aircraft's fuel selector valve?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To select the fuel source for the engine from different fuel tanks

87. Which component is responsible for controlling the flow of fuel from the selected tank?

a. Fuel tank

b. Fuel pump

c. Fuel control unit

d. Fuel valve

88. What is the purpose of an aircraft's airspeed indicator?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To display the aircraft's airspeed in knots

89. Which component is responsible for measuring the aircraft's dynamic pressure to determine airspeed in an aircraft's airspeed indicator?

a. Pitot tube

b. Altimeter

c. Vertical speed indicator

d. Airspeed sensor

90. What is the function of an aircraft's attitude indicator?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To display the aircraft's pitch and roll attitude relative to the horizon

91. Which component is responsible for indicating the aircraft's pitch and roll attitude in an aircraft's attitude indicator?

a. Gyroscope

b. Accelerometer

c. Magnetic compass

d. Inclinometer

92. What is the purpose of an aircraft's vertical speed indicator?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To display the rate of climb or descent of the aircraft

93. Which component is responsible for measuring the rate of change in altitude in an aircraft's vertical speed indicator?

a. Altimeter

b. Vertical speed sensor

c. Vertical speed control knob

d. Vertical speed dial

94. What is the function of an aircraft's altimeter?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To display the aircraft's altitude above sea level

95. Which component is responsible for measuring the atmospheric pressure to determine the aircraft's altitude in an aircraft's altimeter?

a. Pitot tube

b. Vertical speed indicator

c. Altimeter encoder

d. Barometric pressure sensor

96. What is the purpose of an aircraft's magnetic compass?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To provide a basic reference for the aircraft's heading

97. Which component is responsible for indicating the aircraft's magnetic heading?

a. Compass card

b. Flux gate compass

c. Gyro compass

d. Heading indicator

98. What is the function of an aircraft's autopilot system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To automatically control the aircraft's flight path and systems

99. Which component is responsible for receiving and interpreting input from the autopilot control panel in an aircraft's autopilot system?

a. Autopilot computer

b. Control yoke

c. Autopilot servos

d. Autopilot mode selector

100. What is the purpose of an aircraft's flight management system (FMS)?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To assist in flight planning, navigation, and performance management

101. Which component is responsible for storing and processing navigation databases in an aircraft's flight management system?

a. Flight management computer

b. Control display unit

c. Navigation display

d. Flight director panel

102. What is the function of an aircraft's communication system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To facilitate communication between the aircraft and air traffic control

103. Which component is responsible for transmitting and receiving voice and data communications in an aircraft's communication system?

a. Transponder

b. Radio transmitter

c. Radio receiver

d. Communication control panel

104. What is the purpose of an aircraft's transponder?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To transmit an identification code and other information to secondary surveillance radar

105. Which component is responsible for generating the identification code and encoding information in an aircraft's transponder?

a. Transponder antenna

b. Transponder control panel

c. Transponder computer

d. Transponder encoder

106. What is the function of an aircraft's weather radar system?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To detect and display weather conditions ahead of the aircraft

107. Which component is responsible for transmitting and receiving radar signals in an aircraft's weather radar system?

a. Transponder

b. Radar antenna

c. Weather radar display

d. Weather radar control panel

108. What is the purpose of an aircraft's flight recorder, commonly known as the "black box"?

a. To provide stability

b. To generate lift

c. To control the aircraft's speed

d. To record and store flight data and cockpit voice recordings for accident investigation purposes