

The basic aircraft structure serves multiple purposes.

Such as **aircraft aerodynamics**; which indicates how smooth the aircraft flies thru the air (The Skelton of the aircraft greatly affects these aerodynamics and consist of frames and stringers.)

The shape of the fuselage controls this aspect of the aircrafts aerodynamics.

The shape of the Frames control the shape of the fuselage.

Stringers keeps the Frames spaced correctly and gives strength to the Skeleton.

The Skelton is covered with aluminum or composite type materials made up of panels riveted to frames, stringers, and some removable panels to allow maintenance technicians to work efficiently on the aircraft

The purpose of the this covering is to allow pressurization, aerodynamics and to provide protection for the occupants.

The Wing box is attached to the fuselage.

Aft section structure is attached to a Horizontal stabilizer and Rudders

OBJECTIVES

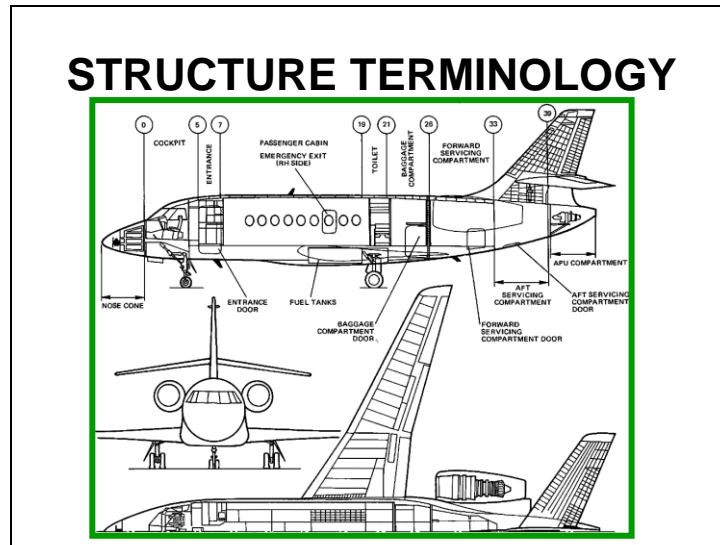
- By the end of this lesson you will be able to:
 - State the Components names and Location of Aircraft Structures
 - Recall the location and function of the components, related to Aircraft Doors, and Nose Cone
 - State the purpose of flight controls

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Access panel

Are removable panels for inspection or Maintenance

Forward

Is the direction the aircraft flies

Fuselage

is the main body of the aircraft, airframe without the wings and the tail

Wings and Under structure of the aircraft (belly are usually fuel tanks)

Frame

is a Loop-shaped fuselage member which gives it its cross-sectional shape and strength

Aft

- the direction of the rear of the aircraft

Aerodynamics

-is the study of how the moving body (aircraft) interacts with air flowing around it, flies

Auxiliary spar

- an extra beam in the root in the wing for extra strength

Center-line of aircraft

the line connecting geometric middle points of cross sections of the aircraft structure

Center wing box

Is the central part of the wing which is located inside, right under (Low Wing) or right above the fuselage (High Wing)

Empennage

- Is the rear section of the body of the airplane with stabilizers

Fail safe

- principle of maintaining adequate performance when some degree of damage or degradation has happened

Rib

- part of the wing structure which provides the wing-section's shape and supports the skin and Stringers

Stringer

- a stiffening member which supports a section of the load carrying skin, to prevent buckling under compression or shear loads

Sweep angle

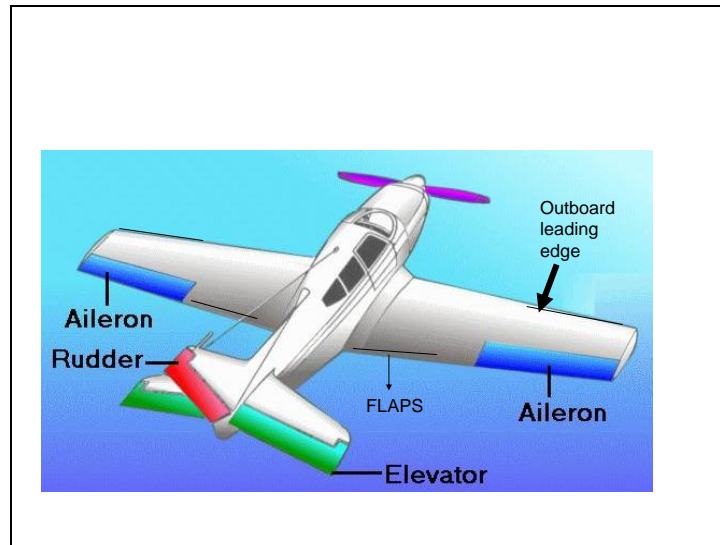
- the angle between quart chord line of the wing and center line of fuselage, swept-back has a positive sweep angle

Tailplane

- the vertical or horizontal planes at the back of the fuselage

Station line

-measuring line or plane giving frame position
-Usually from the tip of the nose measuring Aft in inches to each frame



Listed are the basic flight control surfaces. Larger aircraft flight control systems may include fly by wire systems. While smaller aircraft may use hydraulics or more simplified systems. The flight control surfaces listed here are the basics of a small aircraft.

AILERONS (ROLL)

The control wheel or yoke controls ailerons and turns the aircraft left or right. By turning left or right, the pilot can change the position of the ailerons.

When the control wheel is turned to the right, the right aileron goes up and the left aileron goes down, rolling the airplane to the right. Turned to the left, the right aileron goes down and the left aileron goes up, rolling the airplane to the left.

ELEVATORS (PITCH)

By moving the yoke, the pilot can change the position of the elevators.

Pushing the control column forward, the elevators move down, pitching the tail of the airplane up and the nose down, rolling the airplane down.

Pulling the control column back makes the elevators move up, pitching the tail of the airplane down and the nose up, rolling the airplane upwards.

RUDDER (YAW)

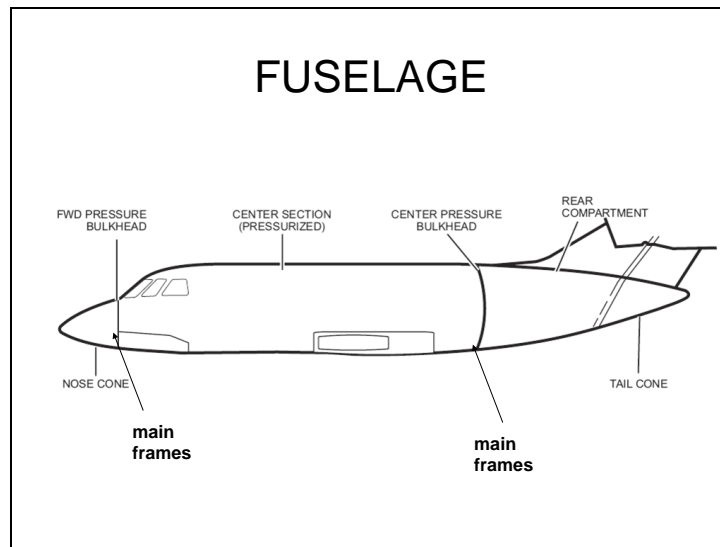
The rudder is the vertical part of the tail that can move from side to side.

Pushing on the left rudder pedal moves the rudder to the left, causing the nose of the airplane to move to the left.

Pushing on the right rudder pedal moves the rudder to the right, causing the nose of the airplane to move to the right.

Outboard leading edges make the wing provide more lift at slower speeds with the Flaps it makes the wing take on a gull wing look by curving it more on the bottom of the wing.

Lift is produced by air flowing over the curved upper wing surface at a velocity higher than airflow on the lower surface. Increased airflow causes an increase in velocity and a subsequent drop in air pressure. There are four variables involved in the production of lift; wing area, wing curve (camber), angle of attack, and airflow. Airflow is achieved by maintaining forward movement. The larger the wing area the thicker the wing require lesser air flow or lower forward velocity



The FUSELAGE is composed of the following:

main frames, usually pressurized bulkheads and engine attach points

secondary frames are the frames between Main frames,

Outer skins, stiffened by stringers, riveted to the structure, made of extrusions of variable thickness and sections.

In some areas this assembly also includes mechanically-milled panels, frames in the openings in the fuselage, and the protective elements Alodine, Primer, and Paint.

Most aircraft have crash skids underneath the fuselage to protect the fuel tanks in the event of a belly landing with the landing gear retracted.

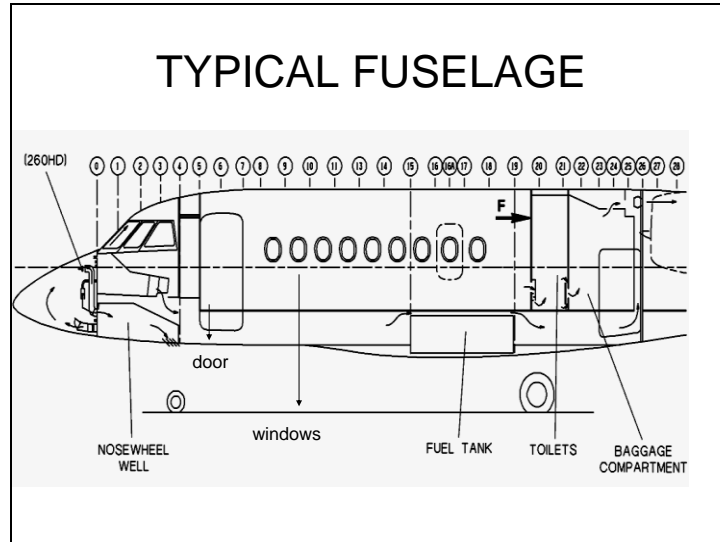
There are Thick protective shields that defend against the possible blow-out of parts from the engine fans at multiple engine mount locations

The fuselage structure is of fully metallic monocoque construction and includes:

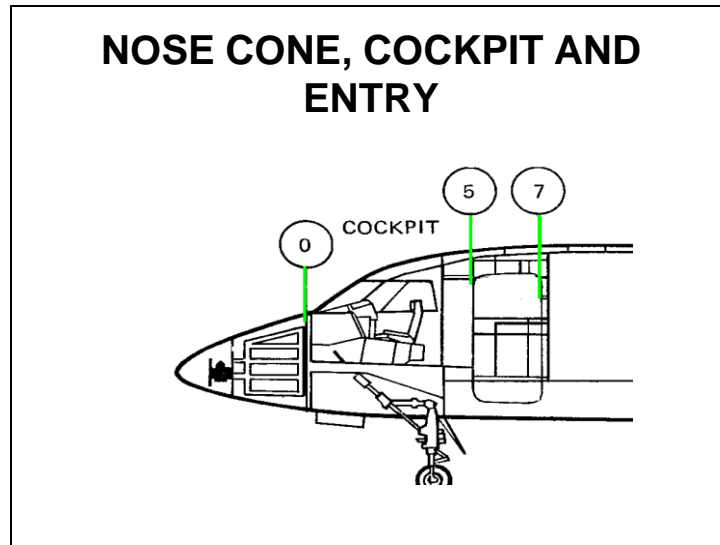
- the cockpit,
- the passenger cabin,
- the center wing tanks,
- The aft baggage compartments,
- and aft service compartments.

The cockpit, passenger cabin and baggage compartment (accessible through an internal door) are pressurized. The cockpit is soundproof and insulated against the effects of condensation resulting from pressurization. Automatic drains are installed below the fuselage for the evacuation of water.

continuous tracks are fixed to the cabin floor structure for the installation of seats.

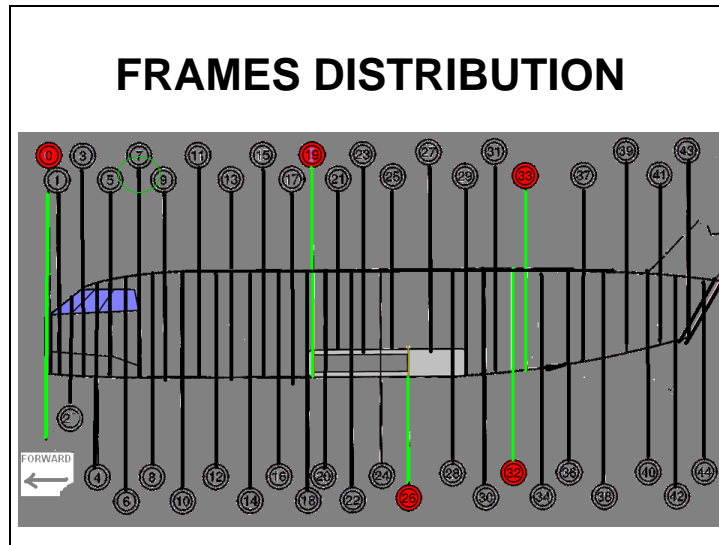


The typical fuselage has windows, floors, and doors to enter the cabin. It also contains the seats, aircraft electrical systems, hydraulic systems, flight control system, toilet, drinking water, storage cabinets, and avionics systems.

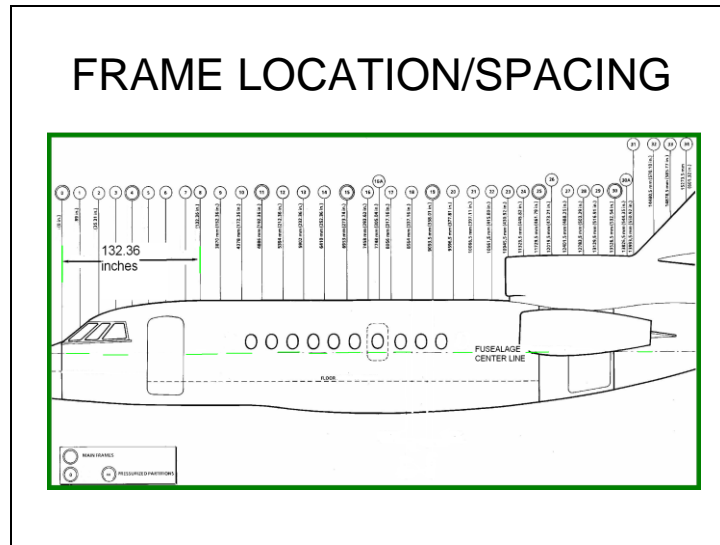


In this [articular visual representation of frame callouts and locations the following is true....

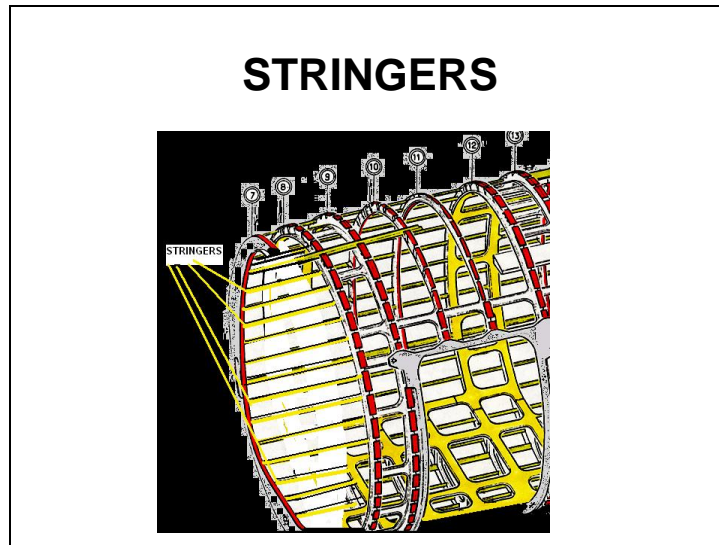
Frame 0 is the First Pressurized Bulkhead- which holds the pressure in the aircraft. All aircraft that fly above 10,000 ft (Very little oxygen) usually have a pressurized cabin typically 8 to 9 pressure per-square-inch or psi (which is what causes your ears to pop). In this visualization Frame 0 thru 5 is the cockpit. Frame 5 thru 7 is the Entry Way.



Frames are distributed forward going aft. the circles in the visualization identify the frames- example 7 frames aft of frame 0 is **frame 7**
The RED ID circles on the frames are pressurized bulkheads (walls) or extra strength frames for added support.



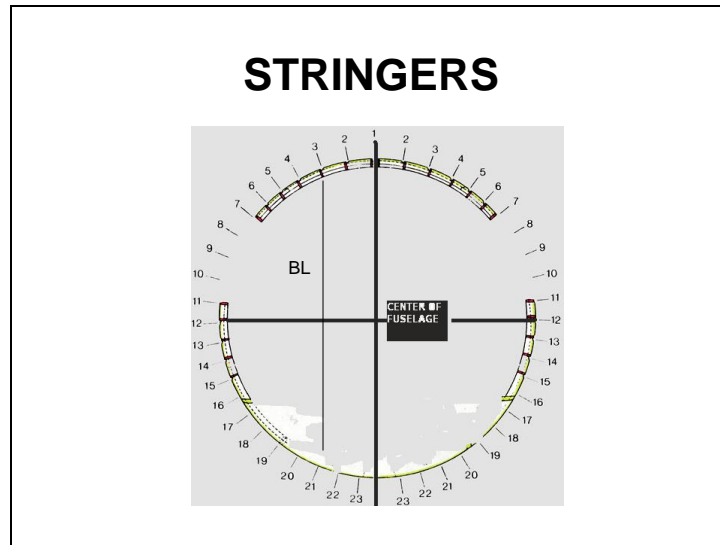
Frame locations are from 0 and go aft usually at 20 to 22 inch spacing. The location of the frame is the dimension from Frame 0 or the nose depending on the manufacturer.



Stringers

Stringers hold the frames in position as well as fill between them to give the structure strength.

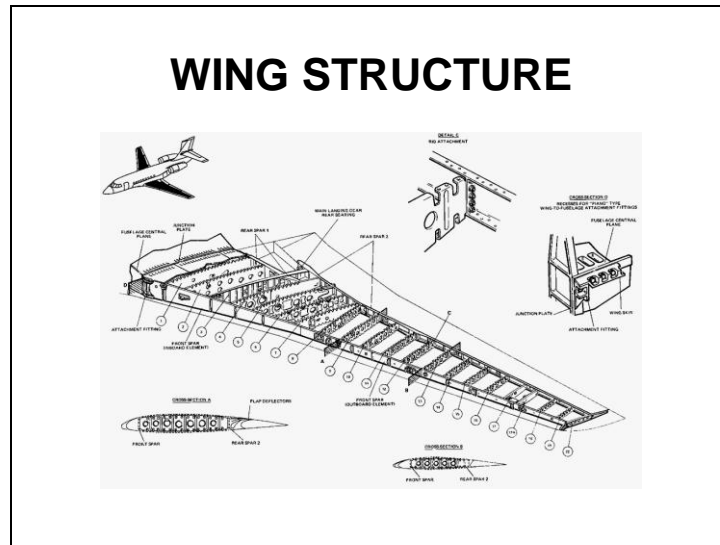
Materials range from 6061 T3 or T6 to 7076 type materials. very strong yet slightly flexible so it does not break.



Stringers are placed like minutes on a clock about a 10 inch spacing
Right hand stringers are R1 R2 R3 ex and left hand stringers are L1,L2L3L going clockwise. L

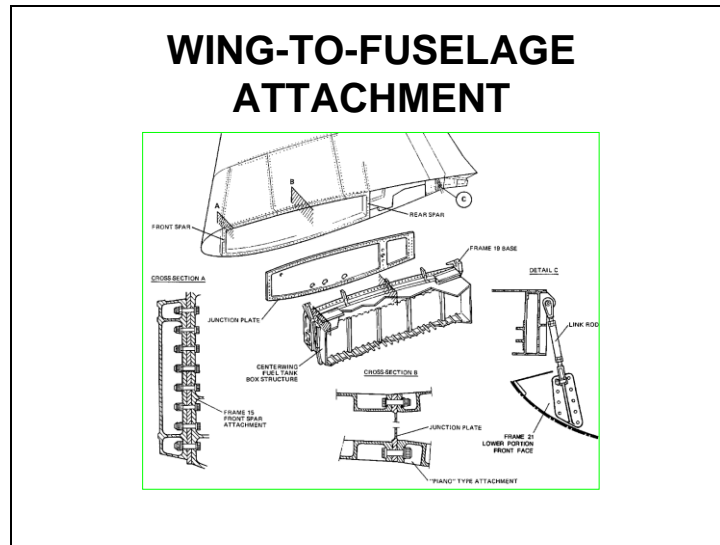
A given dimension from center line over straight up and down is called a butt line (BL), this line is used to place items in the aircraft such has cabinets.

Stations are used for describing the location of frames as well as any spot on the fuselage. The station is usually described as inches aft or forward of the datum. The datum will be anywhere as called out by the manufacturer.



The structure of each wing is basically composed of aluminum alloy panels attached to two spars and twenty two ribs.

Each wing is equipped with:
an outboard leading edge to give the wing more lift,
two trailing edge flaps to make the wing bigger for slower speeds such as landing
one aileron, on each wing, to make turns –Roll.



The WING-TO-FUSELAGE ATTACHMENT structure constitutes the center box structure and is designed to form the structural tank.

The attachment of the wings to the fuselage consist of:

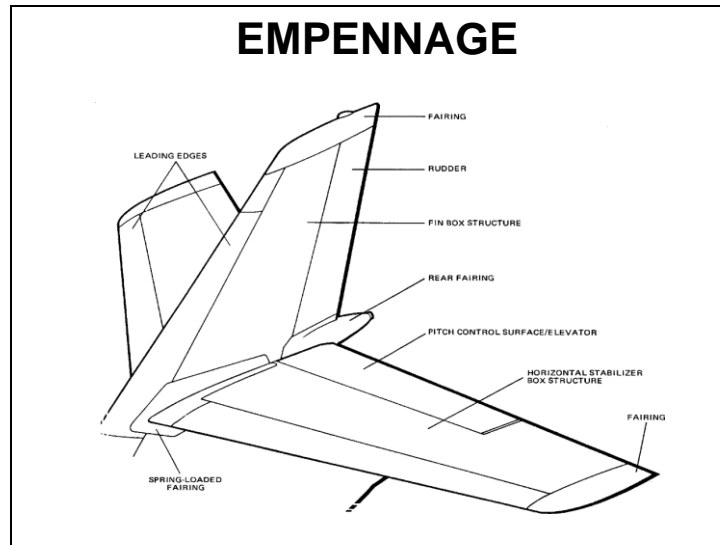
a main attachment to the fuselage box structure,

a secondary attachment to the lower part of frame 21 of the fuselage.

The main attachment of the wings to the fuselage consists of a attachment fitting on the lower and upper surface skins of the center wing box structure and at the foot of frames on the forward and aft spars of the wings.

The secondary attachment attaches the wings to the fuselage through

An Auxiliary spar an extra beam or plate in the center line of the wing for extra strength



EMPENNAGE

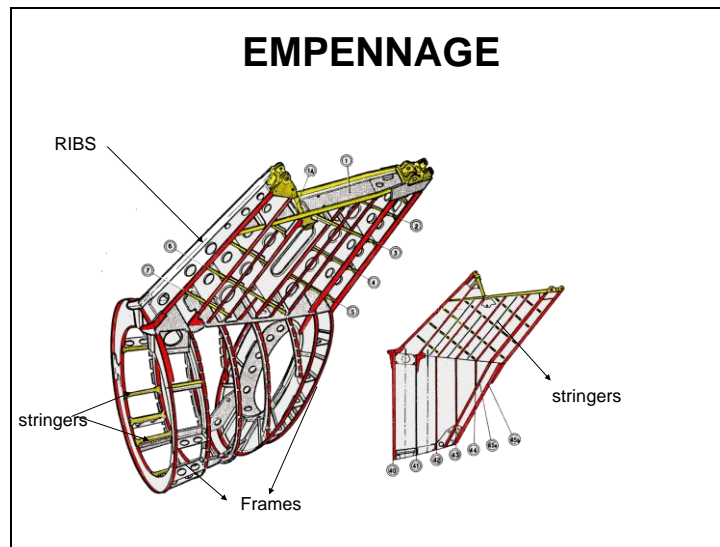
The empennage includes:

a metal fin which sometime includes a two skin composite material leading edge,
an entirely metal horizontal stabilizer, composite material fin top fairings,

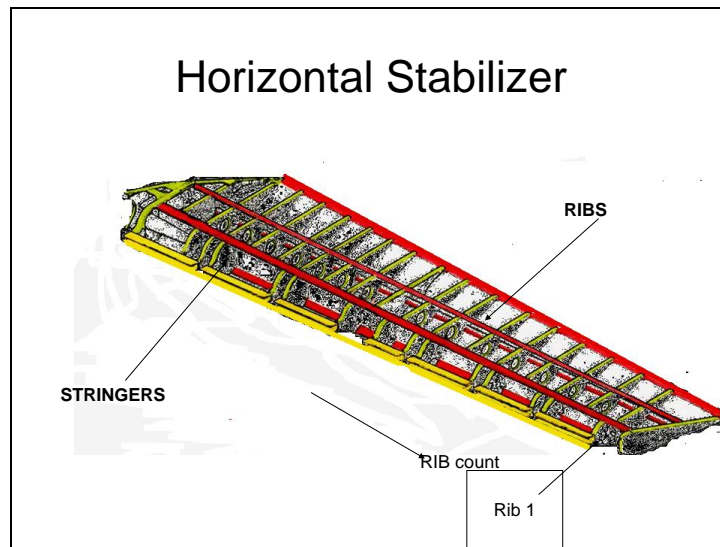
The aft structure supports the empennage, both engines and the APU.

The empennage is made of high resistance aluminum alloy.

Its life as a whole is therefore not limited to time.



The empennage is made up of Frames stringers and Ribs
This gives the tail section its strength.



Horizontal Stabilizer

The Horizontal Stabilizer is made up of ribs and stringers just like the airplane its covered with aluminum skin or composite type materials

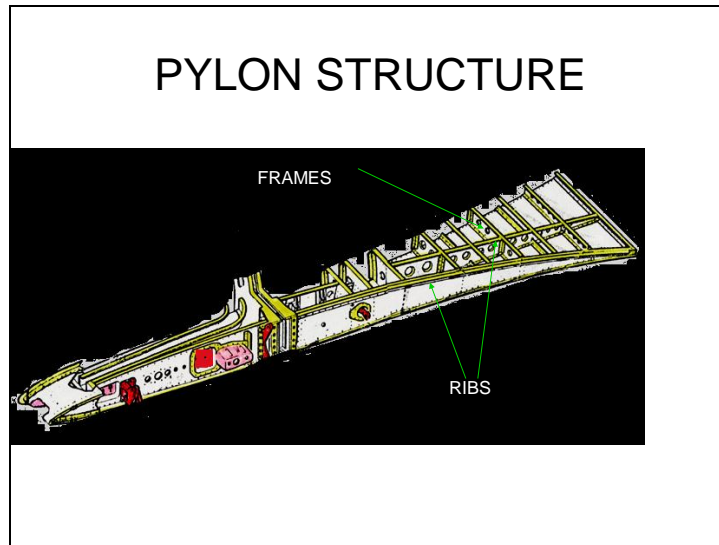
Rib count usually is from the fuselage going to the wing tip starting at 1 this actually depends on the manufacture.

PYLON



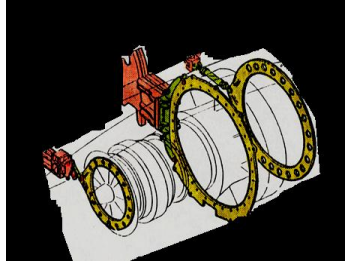
PYLON STRUCTURE

The Pylon is the structure that hold the engines on.



Pylon Structures are made of ribs and frames.

TYPICAL ENGINE MOUNT



Engine mount structures. Because of their purpose and location engine mount structures are subject to extreme heat, vibration and torque. To withstand the demands imposed on them, these structures may be constructed from welded tubular.