



SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution)
Coimbatore - 641 035, Tamil Nadu

DEPARTMENT OF AEROSPACE ENGINEERING

23AST101 - Fundamental of Aerospace Engineering

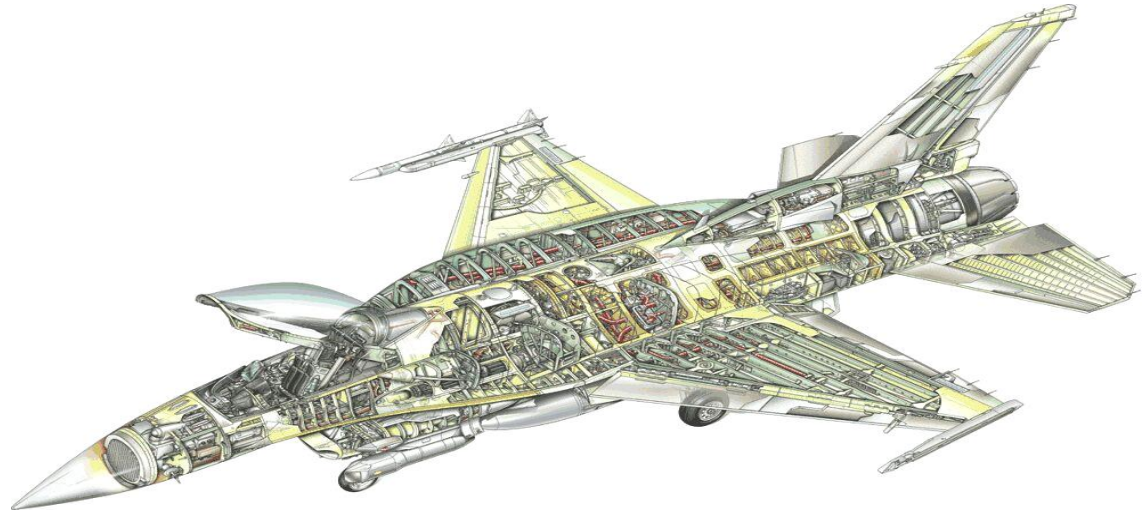
Topic: *Function of Aircraft Structures*

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Recall

- Aircraft Components
- Material use in Airframe Construction
- Example of Material use in Airframe Construction
- Function of Aircraft Structure
- Fuselage Structure
 - Truss Type
 - Pratt Truss
 - Warren Truss
 - Monocoque
 - Semi-Monocoque
- Basic Structure Member Terms
- Wing Structure
- Empennage Structure
- Power Plant
 - Wing Pod Mount
 - Fuselage Mount
- Landing Gear Structure

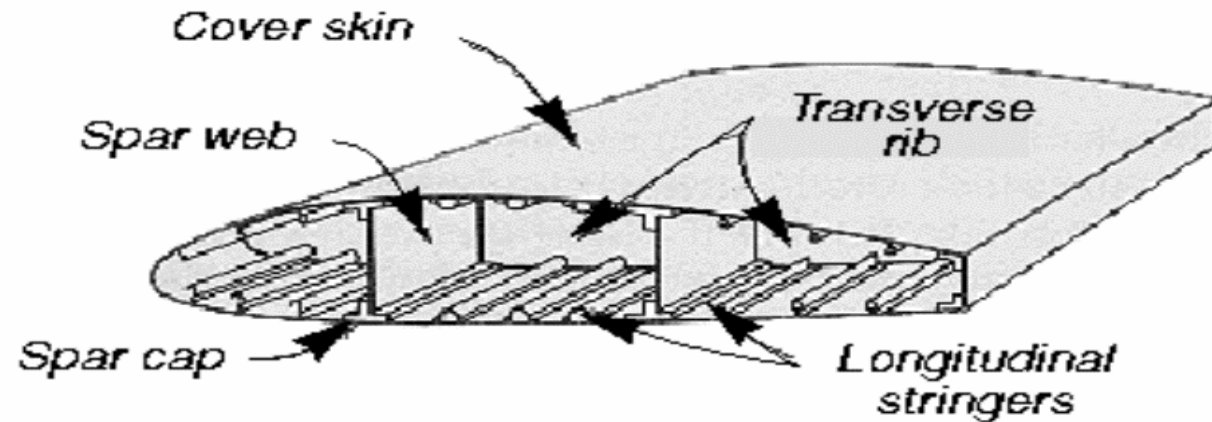




Function of Aircraft Structures

General

- ❖ The structures of most flight vehicles are thin walled structures (shells)



- ❖ Resists applied loads (Aerodynamic loads acting on the wing structure)
- ❖ Provides the aerodynamic shape
- ❖ Protects the contents from the environment



Definitions

Primary structure:

- A critical load-bearing structure on an aircraft.
- If this structure is severely damaged, the aircraft cannot fly.

Secondary structure:

Structural elements mainly to provide enhanced aerodynamics. Fairings, for instance, are found where the wing meets the body or at various locations on the leading or trailing edge of the wing.



Fuselage Structure

BASIC STRUCTURE TYPES



TRUSS TYPE

- PRATT TRUSS

- WARREN TRUSS



MONOCOQUE



SEMI-MONOCOQUE



TRUSS TYPE

Most early aircraft used this technique with wood and wire trusses and this type of structure is still in use in many lightweight aircraft using welded steel tube trusses. The truss type fuselage frame is assembled with members forming a rigid frame e.g. beams, bar, tube etc... Primary members of the truss are 4 longerons. There are two types of truss structure.

- PRATT TRUSS

- WARREN TRUSS



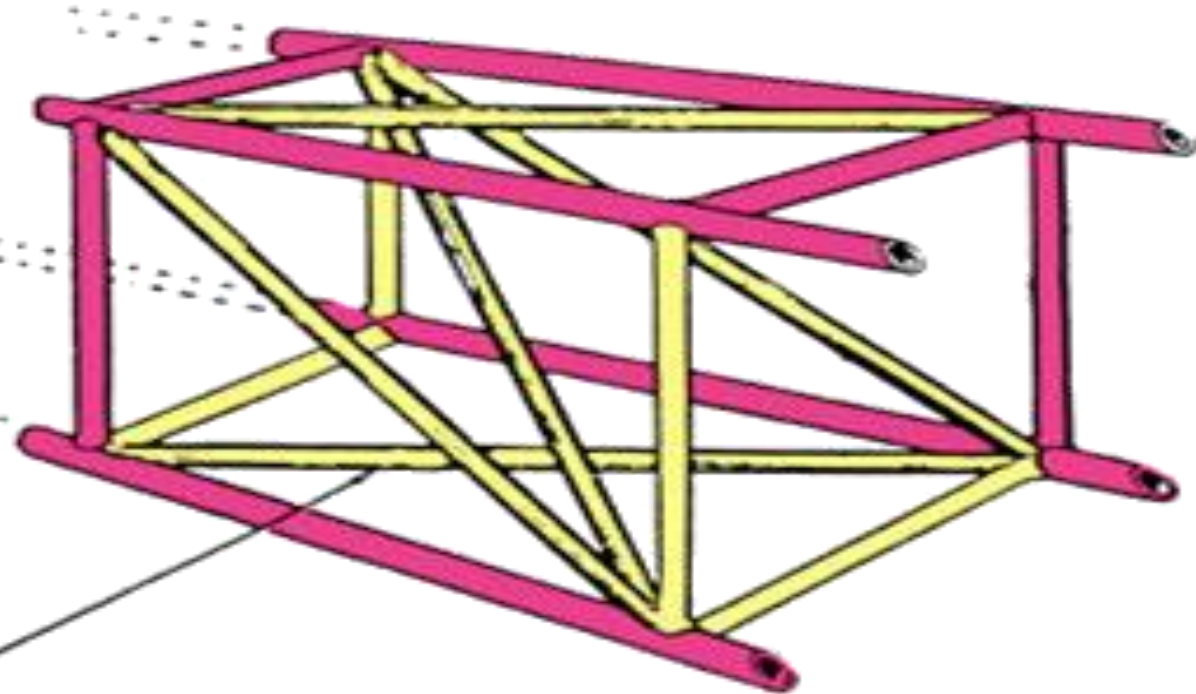


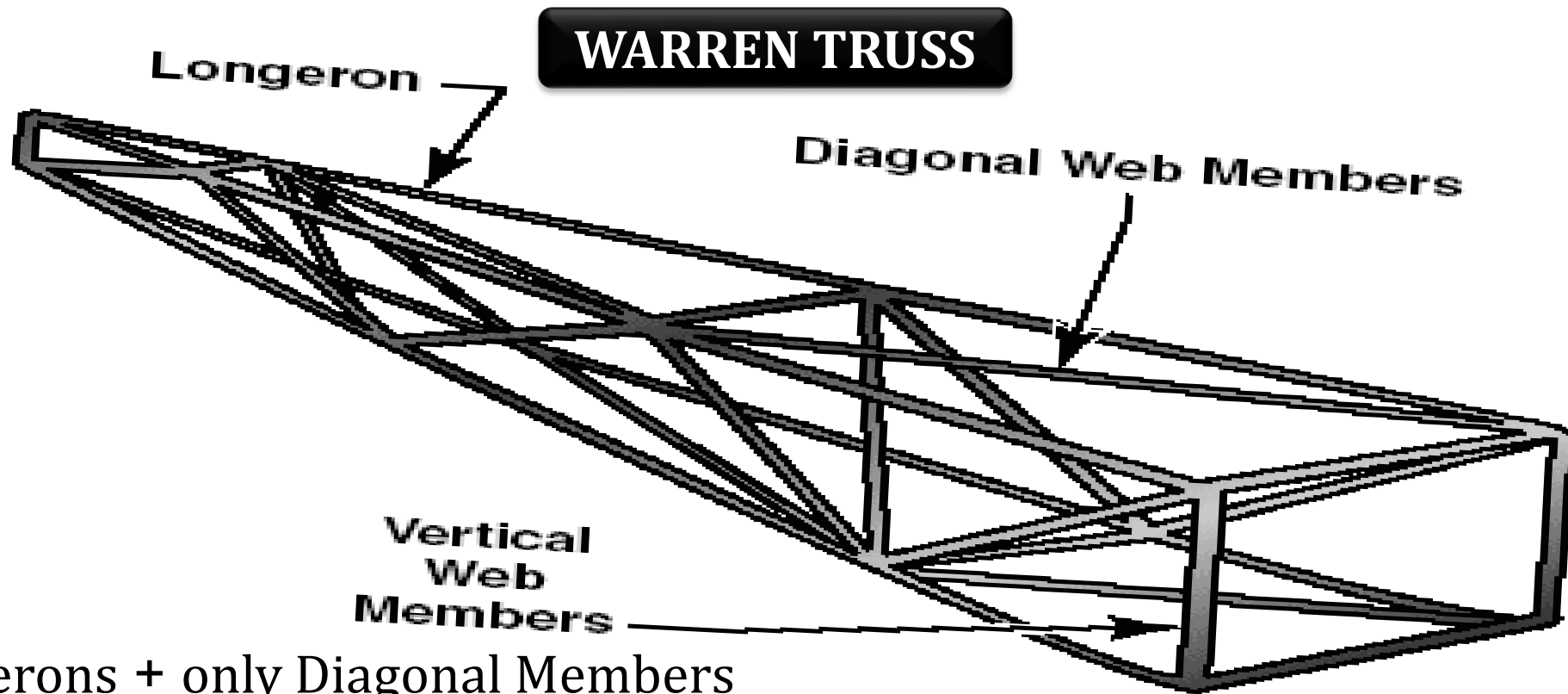
PRATT TRUSS

- Early days
- Wooden or metal structure
- Great weight
- Difficult to streamline
- Box with tubular longerons + vertical members

Diagonal members of tubing or solid rods

Pratt truss.

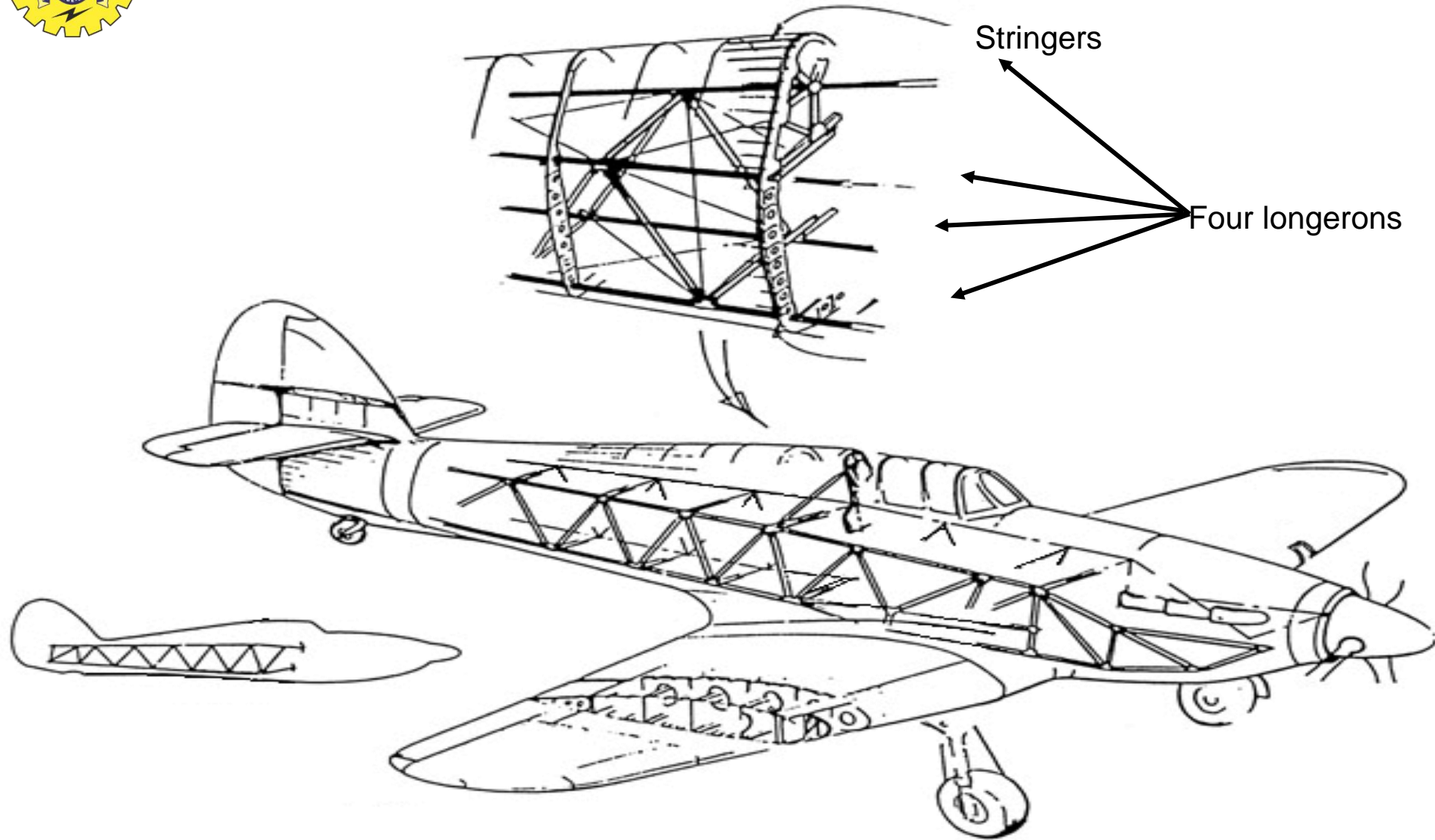




- Longerons + only Diagonal Members
- Force transfer to every others structure
- Capable to carry tension + compression
- Reduce amount of webs work
- More space , strength , rigidity
- Better streamline



Warren Truss Structure of an airplane

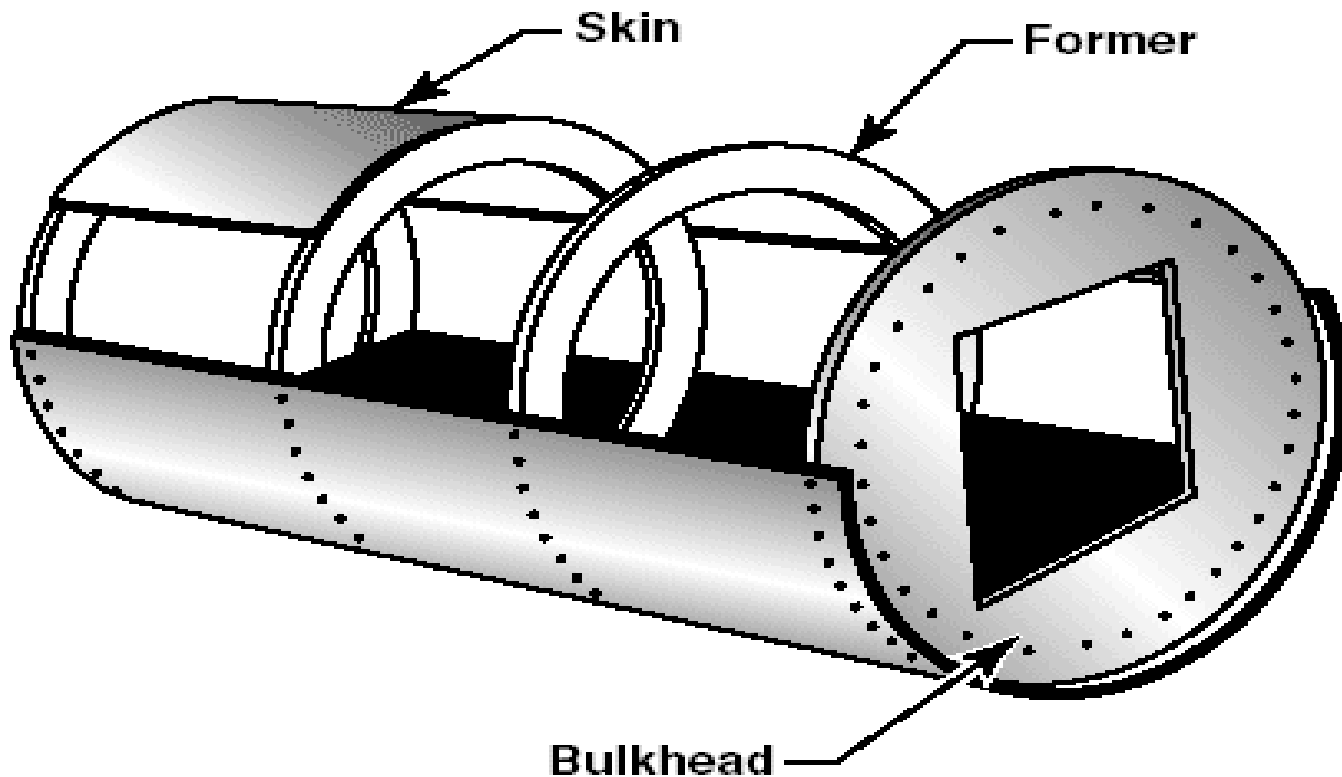




MONOCOQUE

In this method, the exterior surface of the fuselage is also the primary structure.

A typical early form of this was built using molded plywood.



A later form of this structure uses fiberglass cloth impregnated with polyester or epoxy resin, instead of plywood, as the skin.



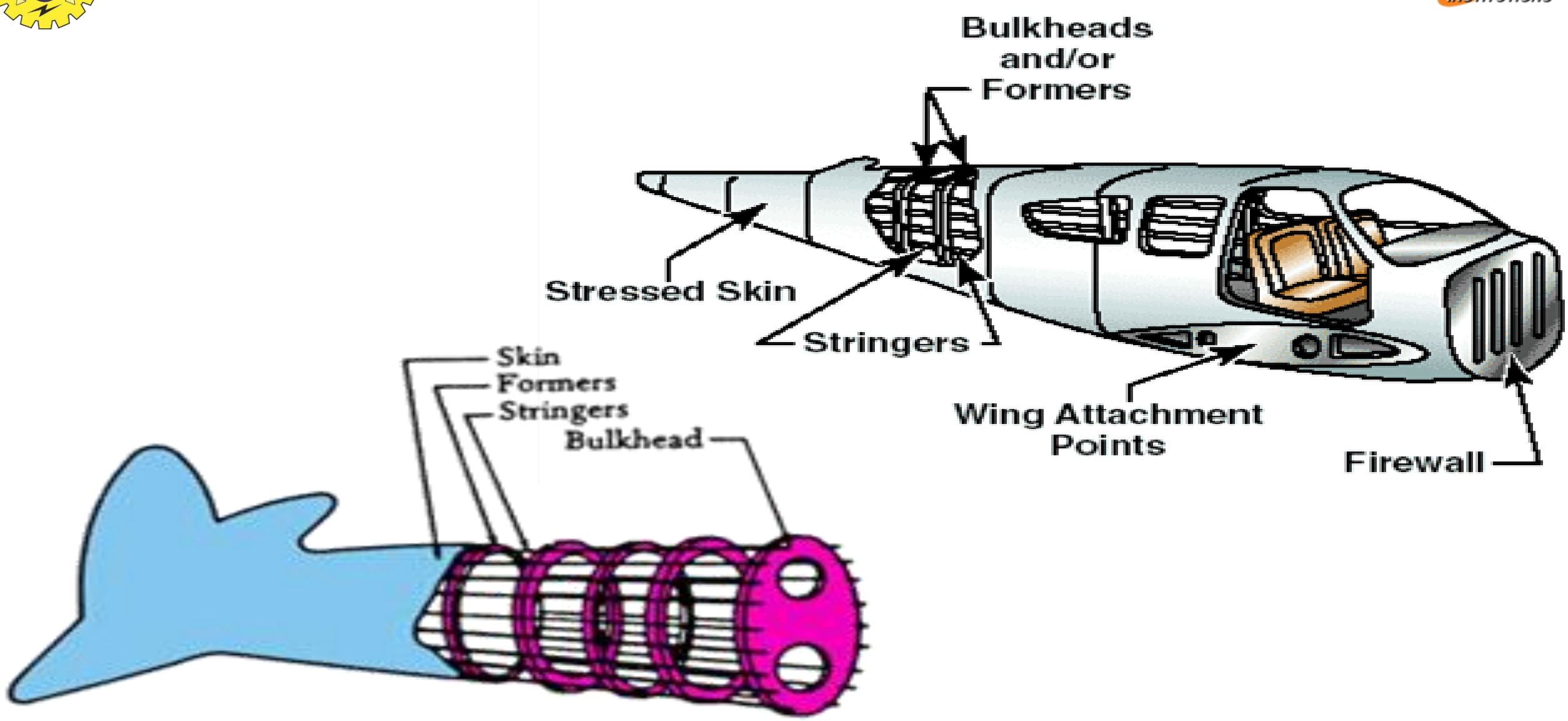
SEMI-MONOCOQUE

This is the preferred method of constructing an all-aluminum fuselage. First, a series of frames in the shape of the fuselage cross sections are held in position on a rigid fixture, or *jig*.

- These frames are then joined with lightweight longitudinal elements called stringers.
- These are in turn covered with a skin of sheet aluminum, attached by riveting or by bonding with special adhesives.
- Most modern large aircraft are built using this technique, but use several large sections constructed in this fashion which are then joined with fasteners to form the complete fuselage.

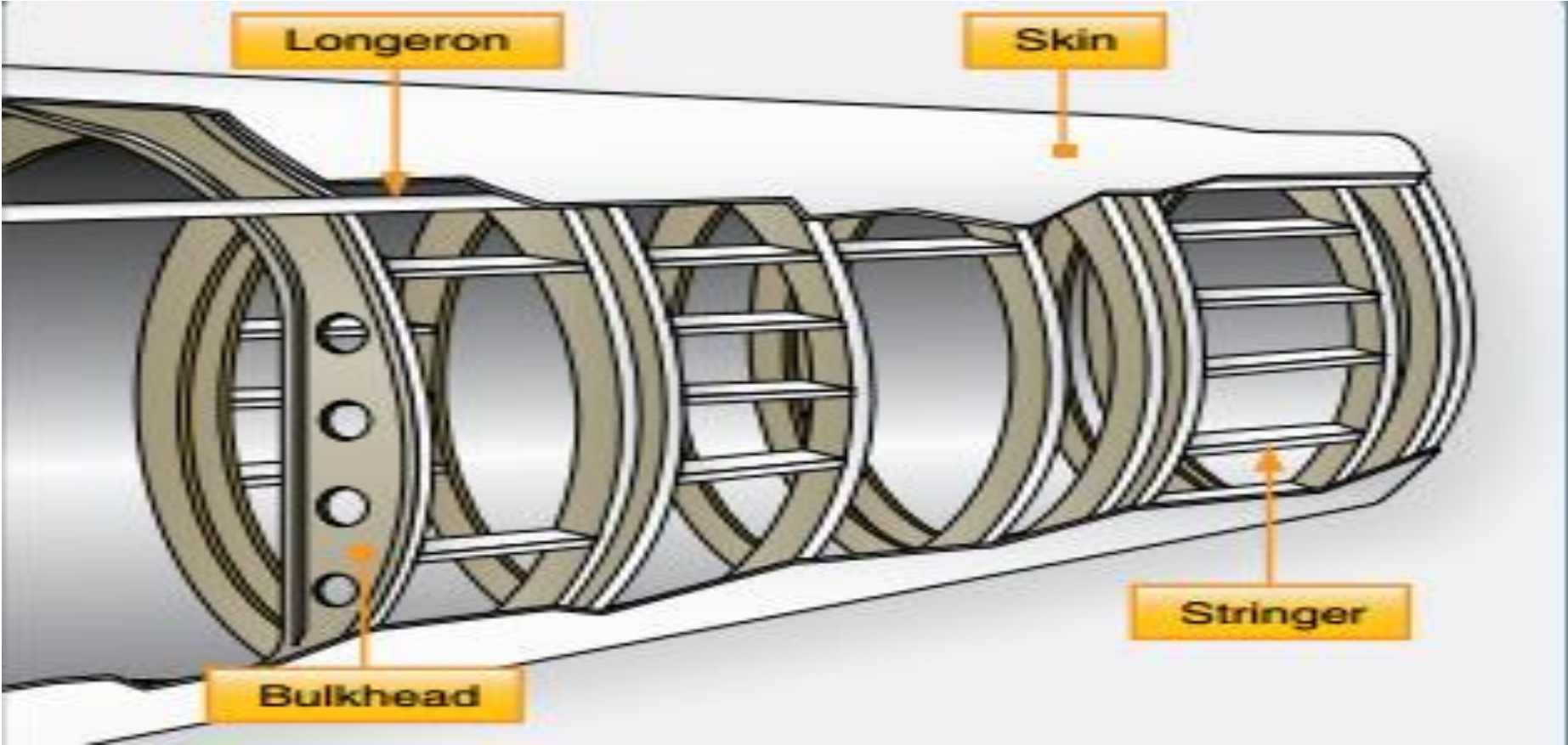


Semi-Monocoque Structure of an airplane



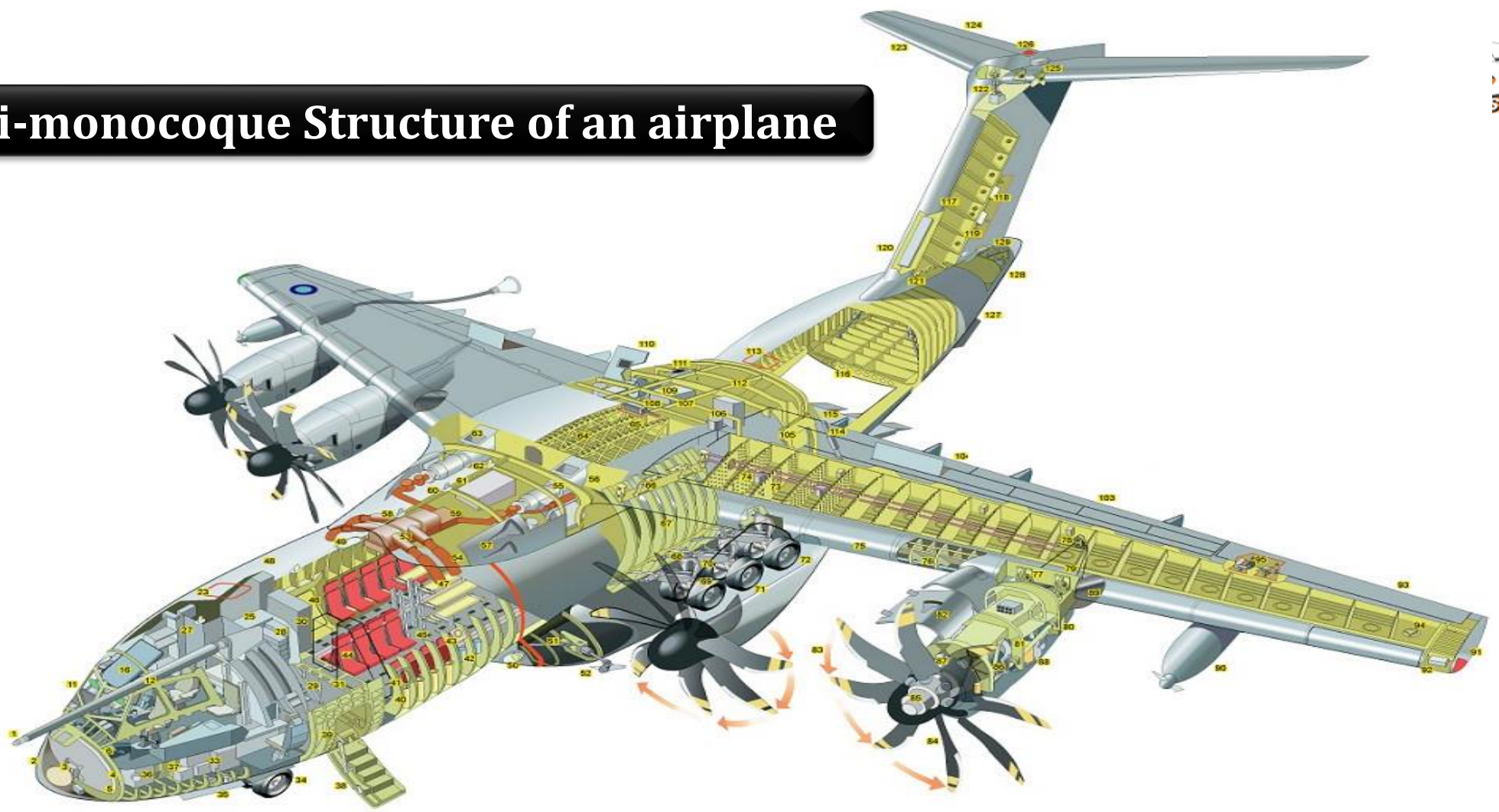


The most common airframe construction is semi-monocoque





Semi-monocoque Structure of an airplane



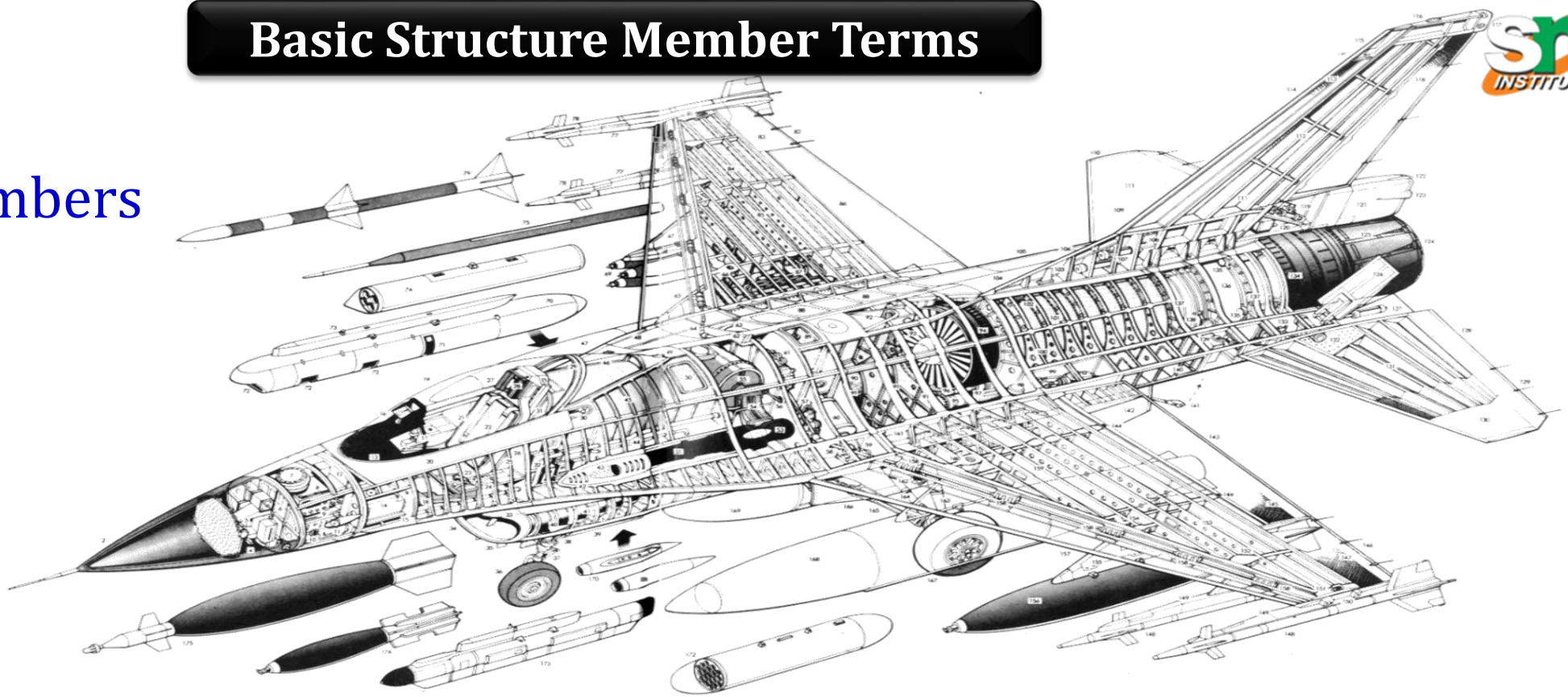


Basic Structure Member Terms



Vertical Members

- Formers
- Frame
- Ring
- Bulkhead



Longitudinal Members

- Longerons
- Stringers



Thank You

