Department of Aerospace Engineering
AE332 - Aerospace Structures II

Basic Construction and Functions of Aircraft Parts

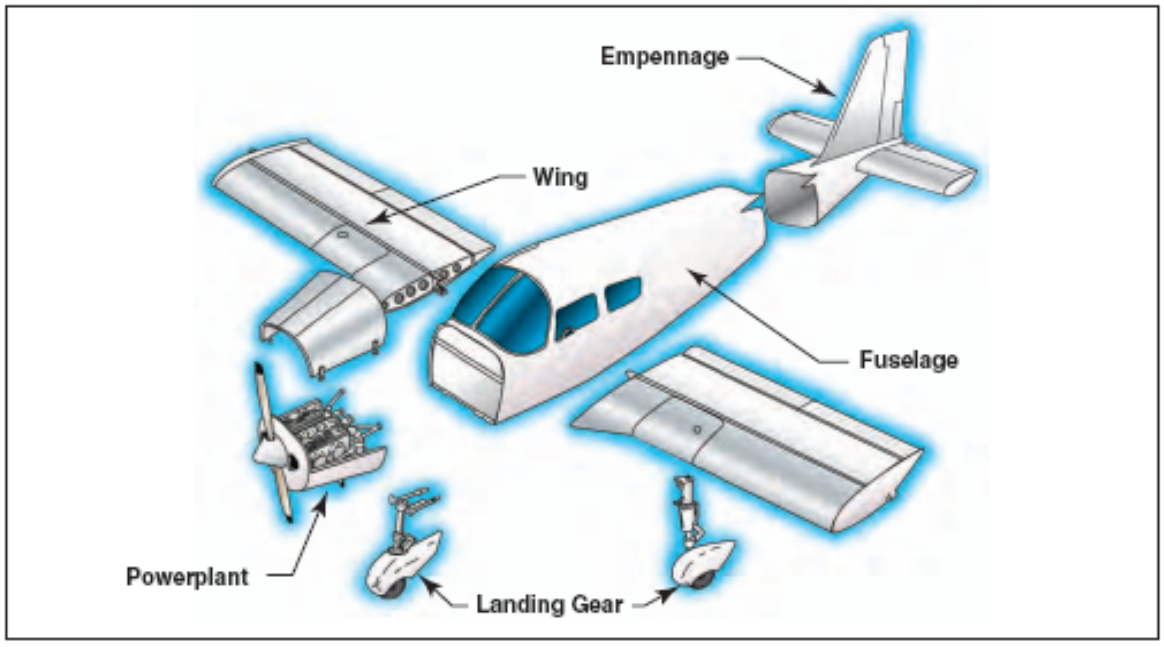

Figure 1: Parts of an aircraft

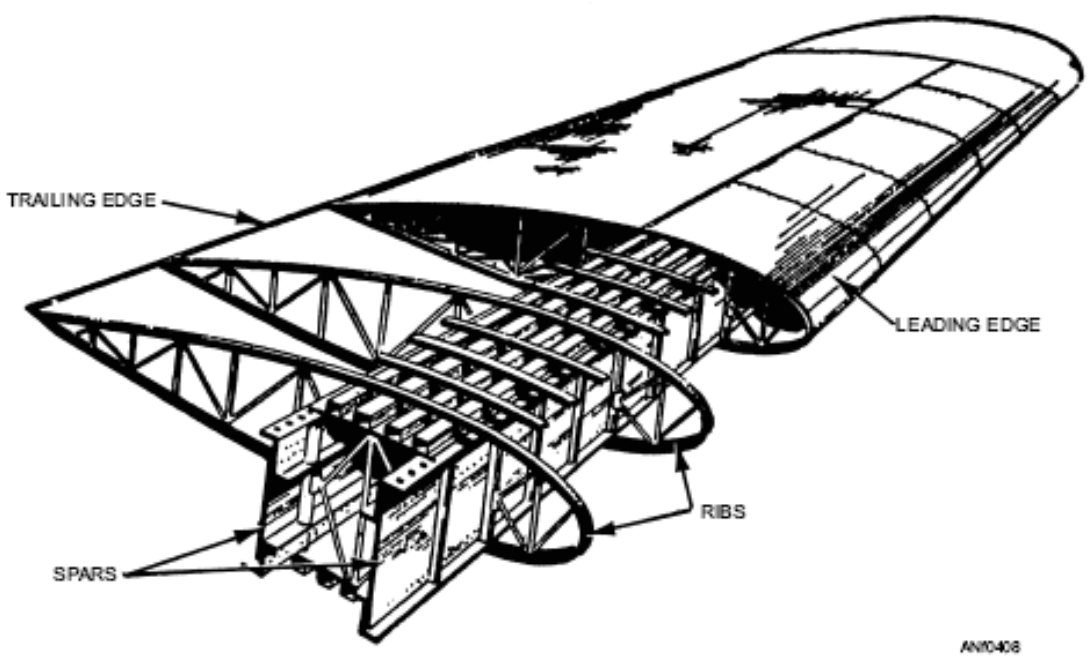

Figure 2 (a): Construction of a typical aircraft wing

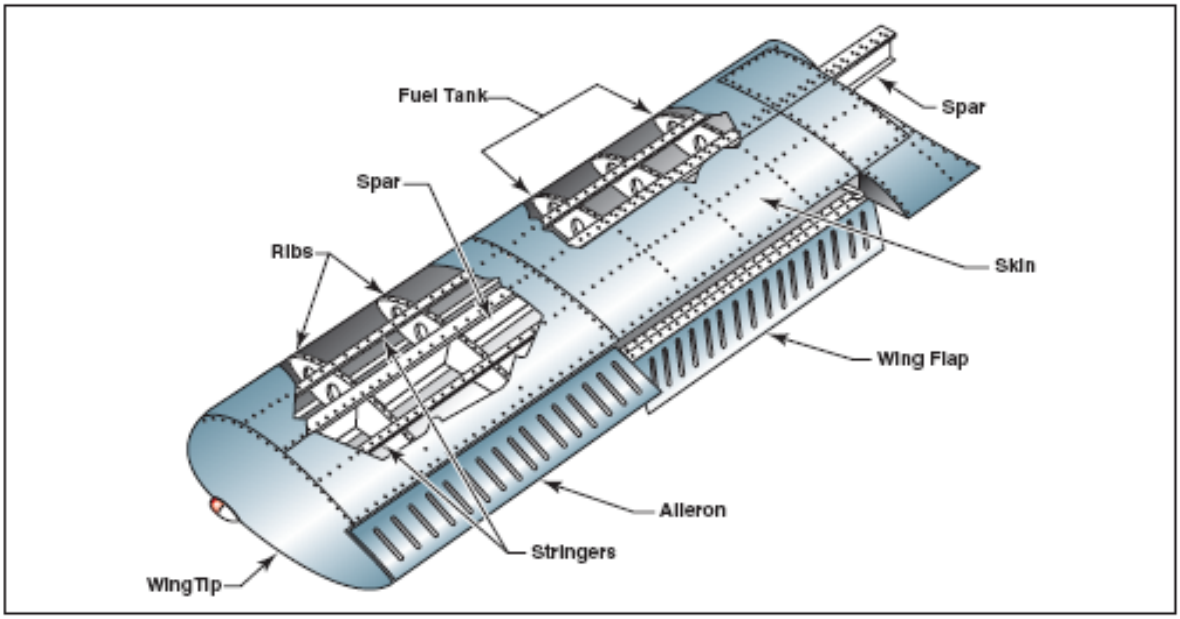

Figure 2(b): Wing construction

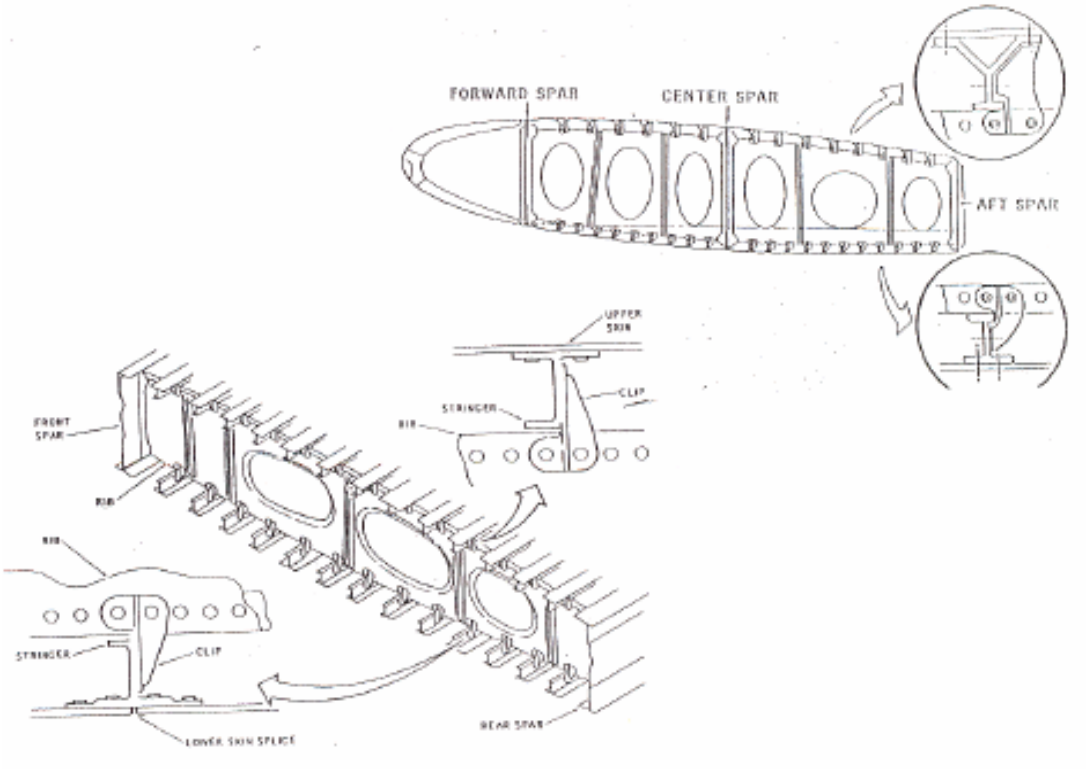

Figure 3: Wing box cross-section

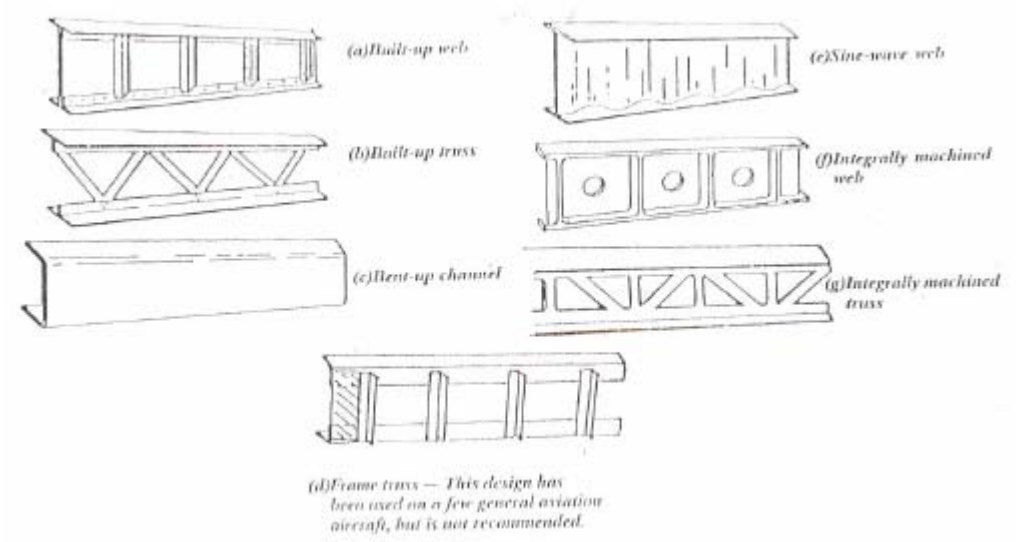

Figure 4: Typical wing spar configurations

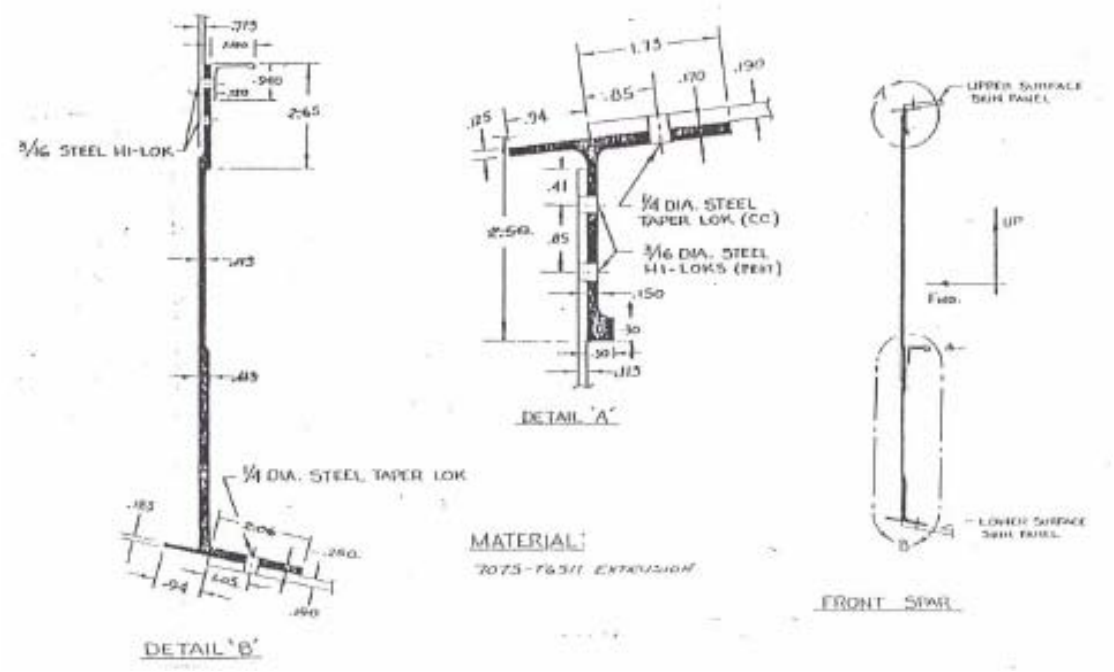

Figure 5: Wing front spar (of C141 wing)

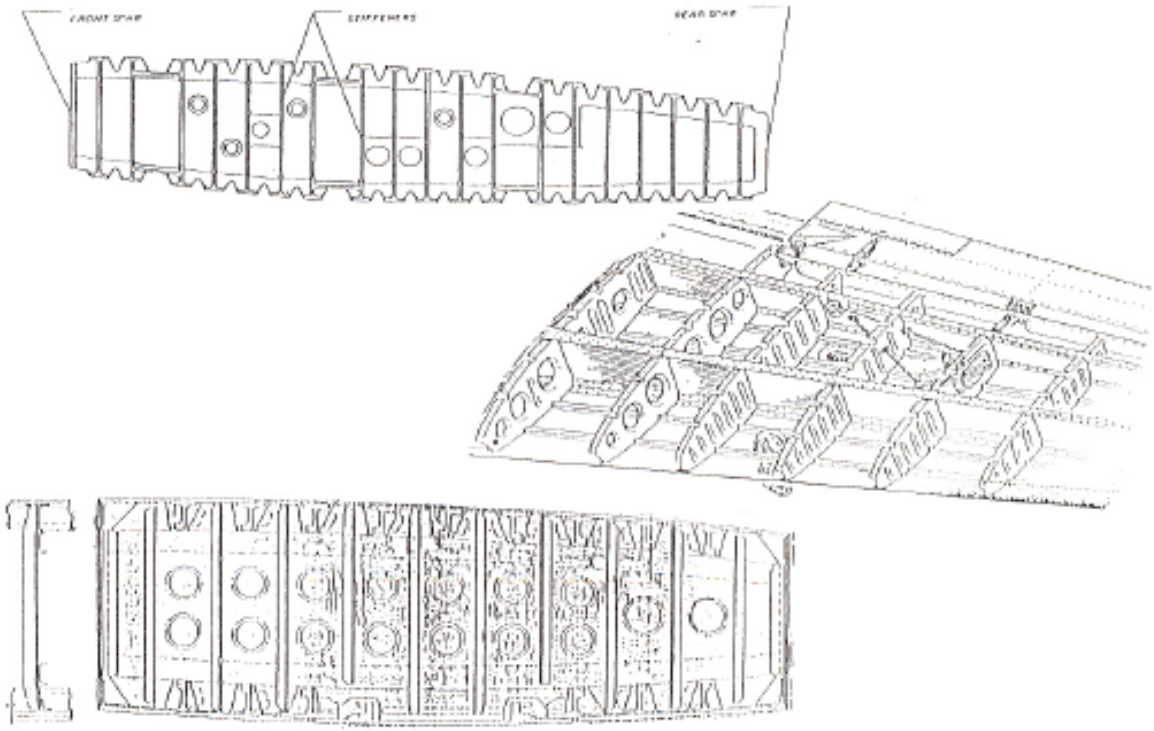

Figure 6: Typical wing rib configurations

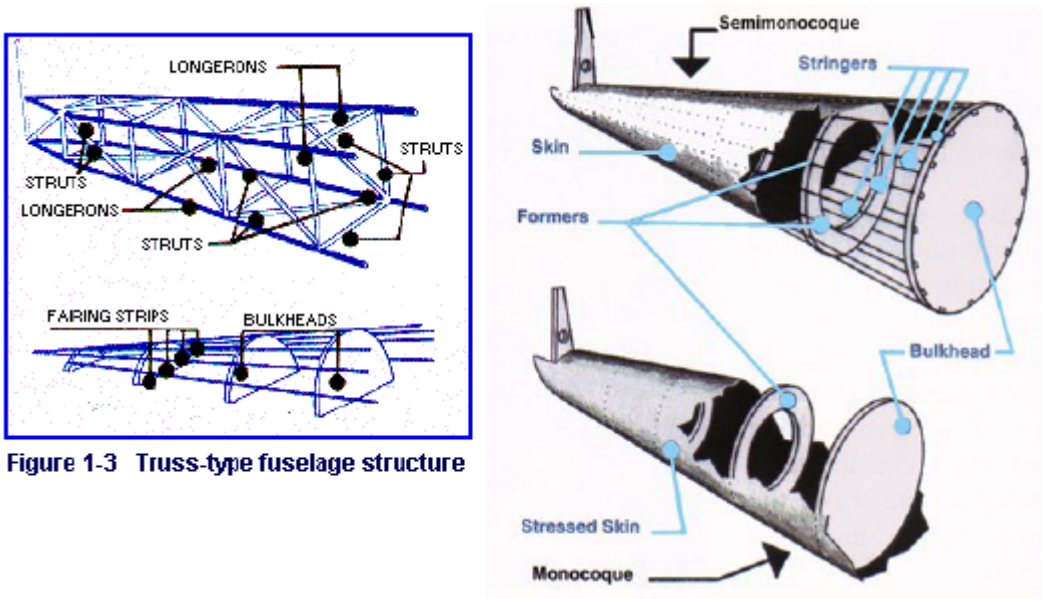

Figure 7: Fuselage structure types

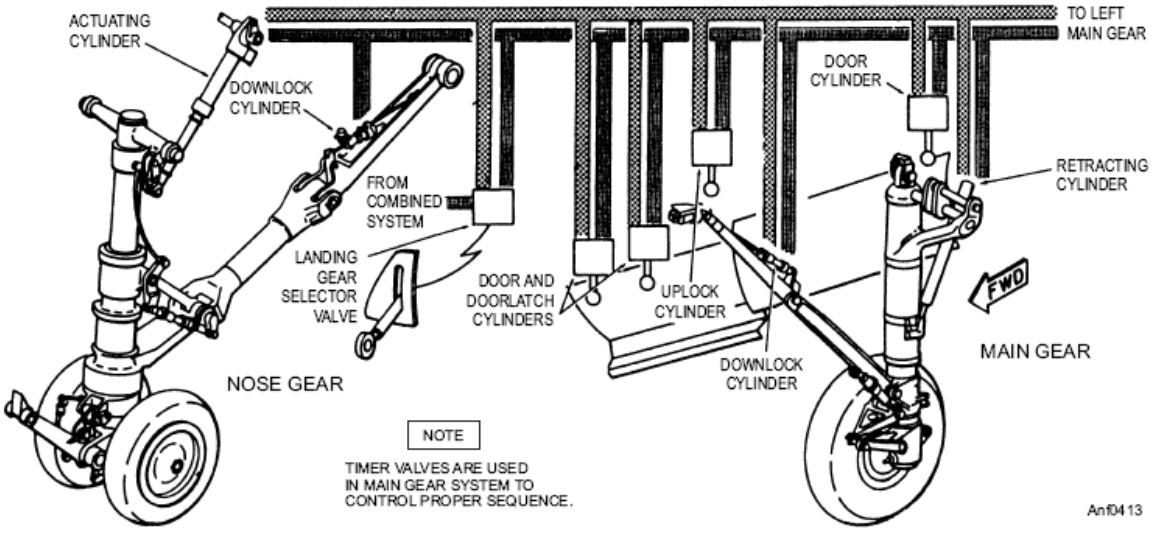

Figure 8(a): Typical landing gear system

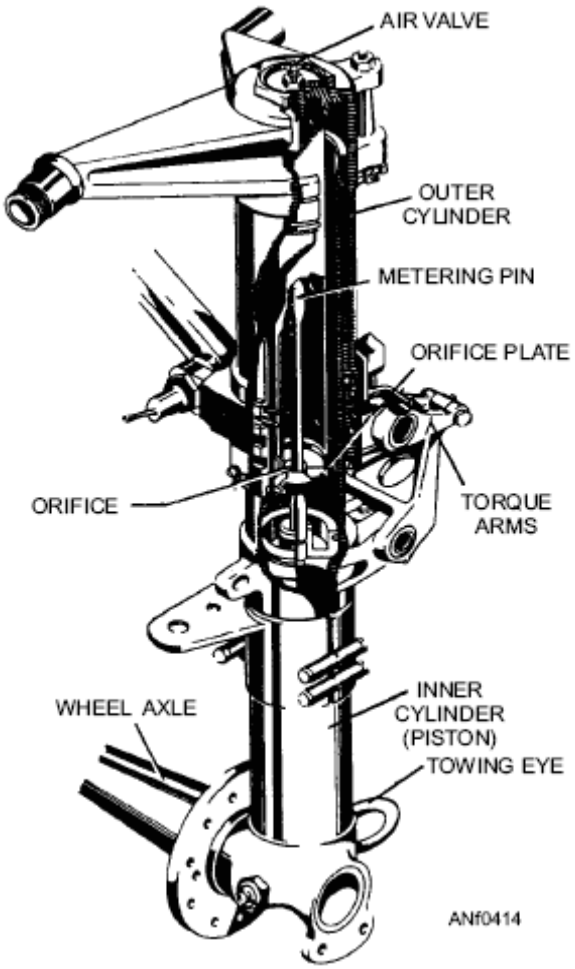

Figure 8(b): Internal construction of a shock strut

Typical Transport Aircraft Wing Structural Weight Distribution

Engine 20%
Interior: 15%
System: 20%
Airframe: 45% **1) Wing 45%** **2) Fuselage 45%** **3) Tail 10%**

Skin stringers and spar caps	39%
Access doors, splicers and attachments	8%
Spar webs	7%
Ribs	5%
Bulkheads	8%
LE and TE	11%
Secondary structures	4%
Control surfaces	18%

Functions of Skin or Cover

1. **It transmits the aerodynamic forces to the longitudinal and transverse supporting members by *plate and membrane action***
2. **It *develops shearing stresses* which react to the applied torsional moments and shear forces.**
3. **It *acts with the longitudinal members in resisting the applied bending and axial loads*.**
4. **It *acts with longitudinal in resisting the axial load with the transverse members* in reacting the hoop or circumferential load when the structure is pressurized.**
5. **In addition to theses, it provides an aerodynamic surface and cover for the contents of the vehicle.**

- **Spar webs play a role that is similar to function 2 of the skin.**

Functions of Longitudinals, Stringers or Stiffenners (Longerons)

1. **They *resist bending and axial loads* along with the skin.**
2. **They *divide the skin into small panels* and thereby increase its buckling and failure stresses.**
3. **They *act with the skin in resisting axial loads* caused by pressurization.**

- **The spar caps in an aerodynamic surface perform functions 1 and 2.**

Functions of Frames, Rings (Bulkheads)

1. **Maintain cross section shape**
2. **Distribute concentrated loads into the structure and redistribute stresses around structural discontinuities.**
3. ***Establish the column length and provide end restraint for the longitudinal to increase their column buckling stress*.**
4. ***Provide edge restraint for the skin panels and thereby increase the plate buckling stress of these elements*.**
5. **Act with the skin in resisting the circumferential loads due to pressurization.**