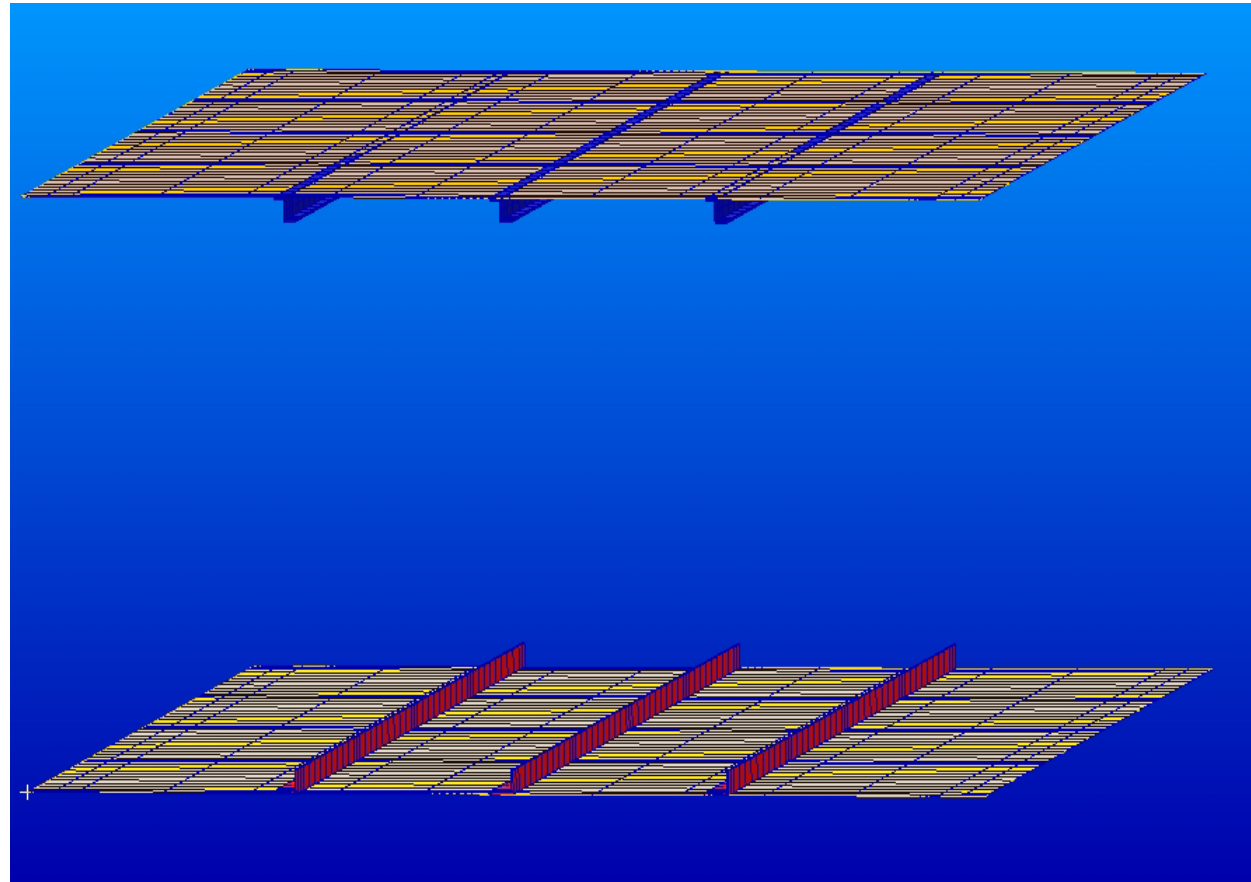# Skin-Stiffener Representation

- Top elements represent top skin plus stringers of a wing box section

- Assume the top skin is subjected to compression

- Skin is modelled with 2D shell (plate) elements

- Stringers are modelled with 1D beam elements with offsets defined

FBD

- Assume at any section of the panel, Ptotal is the gross internal axial load generated due to bending.

- FBD of the stiffened panel is

- Ptotal = Pgskin + 3*Pstr

Ptotal

Pstr

Pgskin
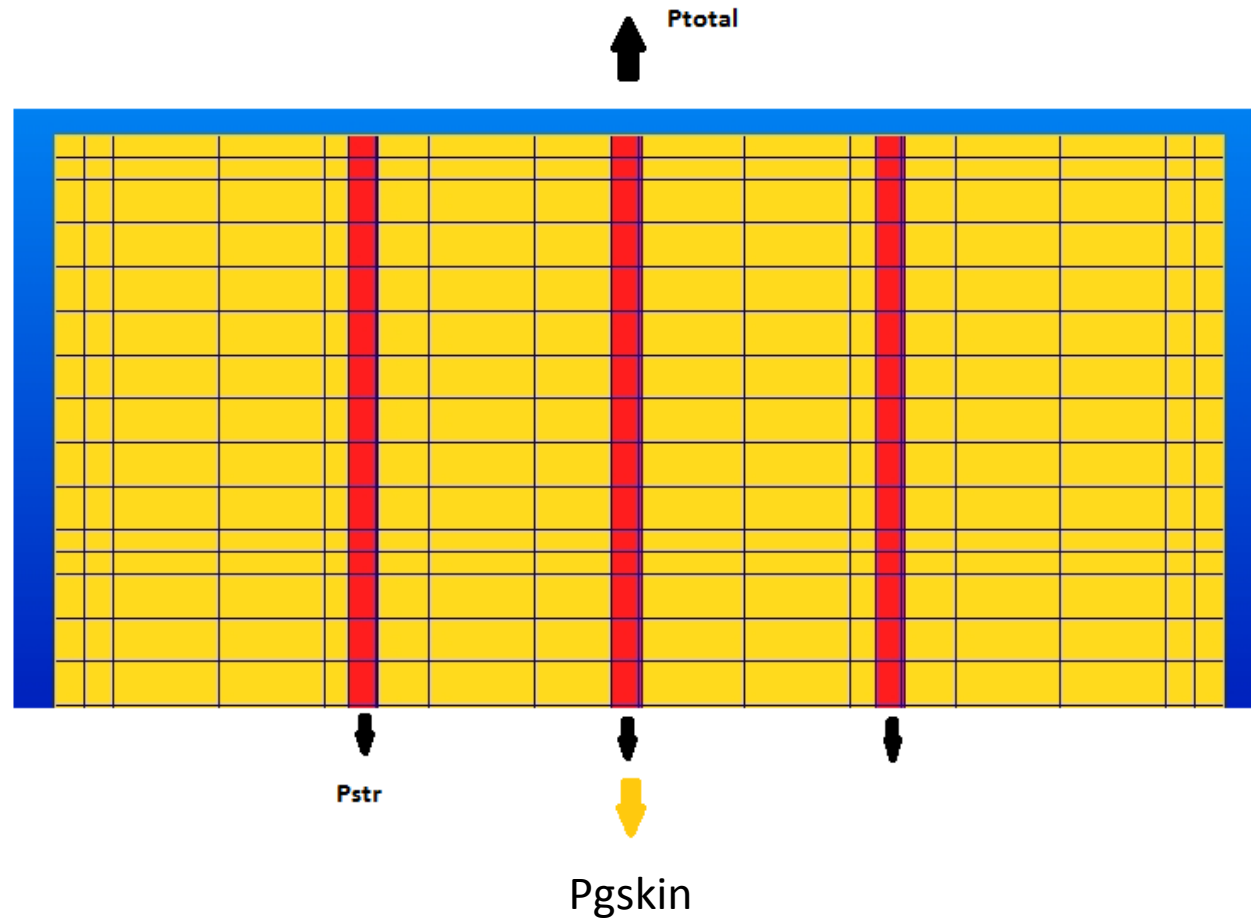
Internal Loads Extraction

- To extract the internal loads, using Freebody Loads option in Patran, the entire GPFB output is extracted as shown in the left.

- As can be seen, Patran throws GPFB output even for skin (2D) panels.

- What we usually do is sum up the GPFB contribution of the entire section and designate it as Ptotal

- Then we separate the individual contribution of each STR & skin panel using the FBD & relation Pgskin = (P/A)total x Atotal

- For Stringer, the GPFB loads can be known directly from PATRAN
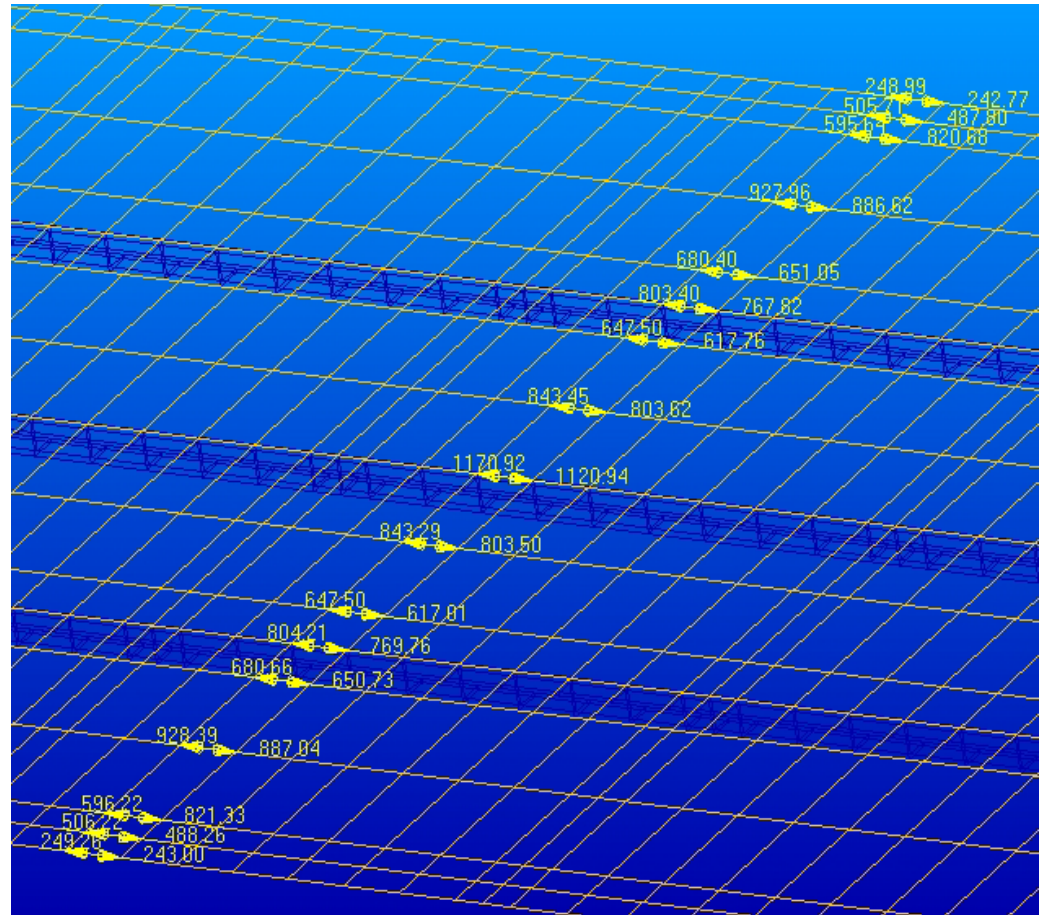
Delumping

- As you have mentioned, if we consider the effective width of the skin as 30t, then area contribution of skin = $30t^2$

- Total Area = $Astr + 30t^2$

- So we have Pstr as found from Patran GPFB output.

- If we delump the load as designate the new individual components as Pdskin and Pdstr, then the FBD is
    - Pstr = Pdskin + Pdstr

- After obtaining the individual member loads, my question is does the new skin load becomes Pskin = Pdskin + Pgskin ?