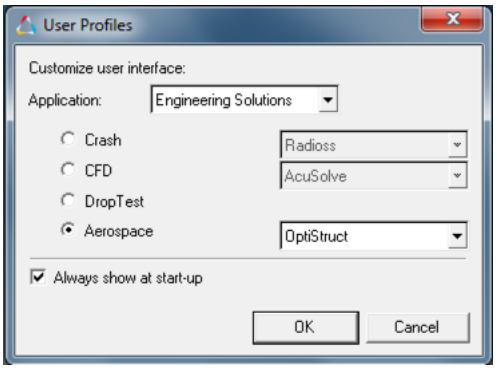
Exercise 11a – Auto Beam Property

The purpose of the Beam Auto Property tool is to quickly generate cross section beam elements properties from a solid. Typically this would be used to help generate global loads models.

Step 1: Switch to the Aerospace profile and open the model

1. Select the **Aerospace** User Profile with the **OptiStruct** option.

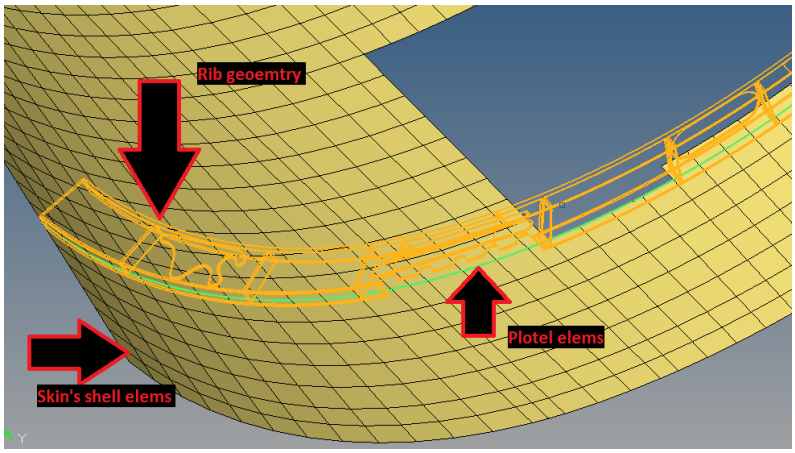


2. Open the HyperMesh model file, `11a_GFEM_beam.hm`.

Step 2: Interrogate the model

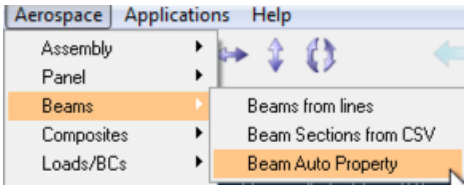
1. Use the Model Browser to toggle on and off the geometry and mesh in each component.

   Notice that **20737:Part3.1** contains the geometry for a rib, **Skin-FEM** contains elements representing the airframe skin and **Plotels** contains 1D plotel elements.

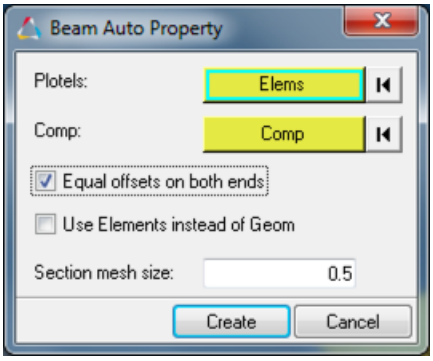


Step 3: Use the Beam Auto Property tool to assign 1D cross section properties to the plotel elems

2. From the menu bat select ***Aerospace > Beams > Beam Auto Property.***

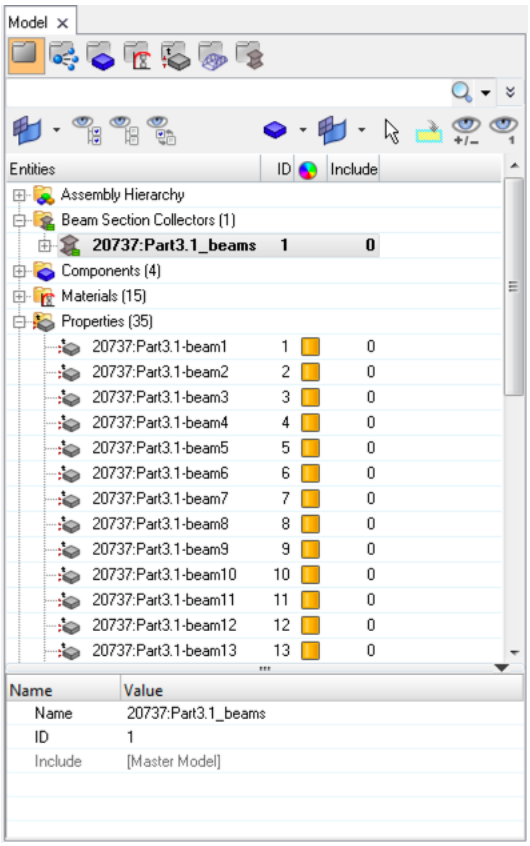


3. With the dialog now open, select the elements in the **Plotel component** for the **Plotel** field.
4. Select **20737:Part3.1 component** for the **Comp** field.
5. Check the **Equal offsets on both ends** option as well.



6. Once selected, click **Create**.
7. You will notice that the tool will then make 2D cross section properties for each element. It will slide the CAD normal to the nodes of each plotel element to define the cross section boundaries. Additionally, the 3D beam visualization was turned on to graphically visualize the beam sections it defined.

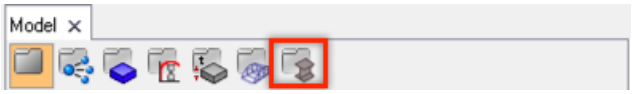
8. Go into the Model Browser and notice that 35 beam properties were created, one for each plotel element.



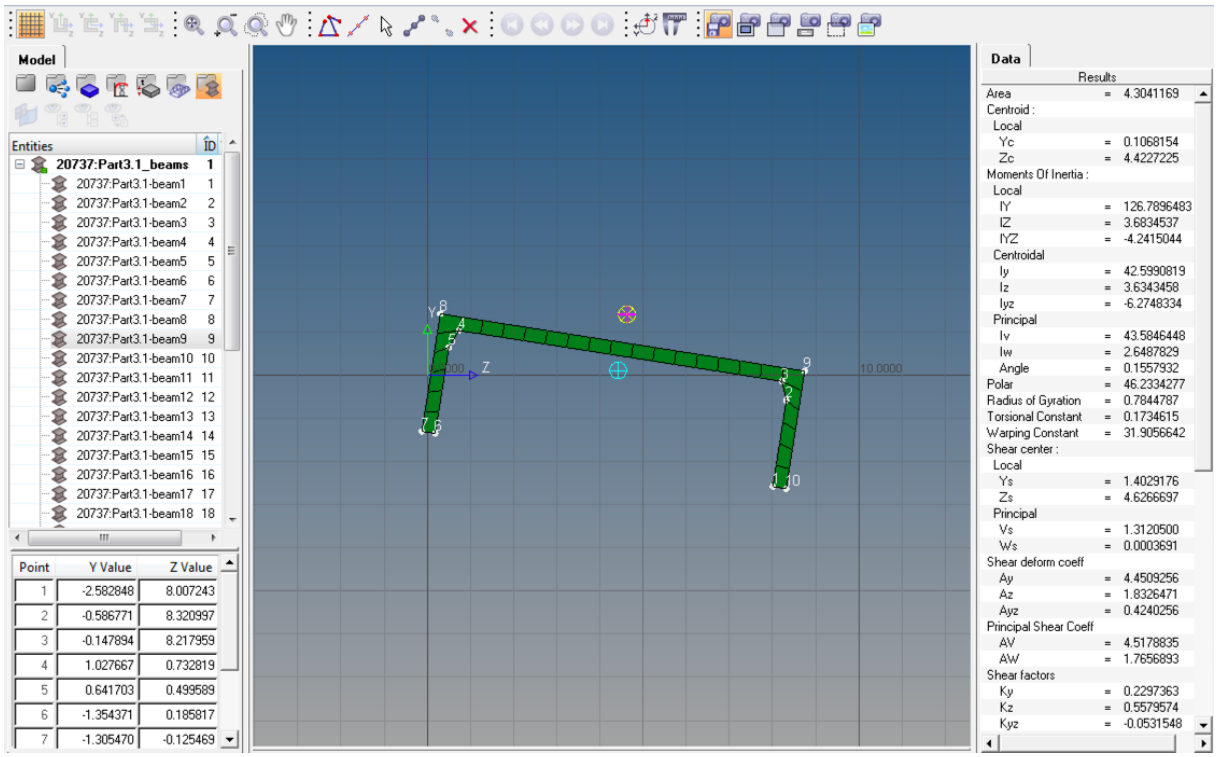
Step 4: Review the section definitions in HyperBeam

Now that the section information was generated, review it both in the graphics area and in HyperBeam.

9. From the Model Browser, select the **HyperBeam** view icon to visualize the section information.



10. Click through the definitions to review different cross sections.


Model
Entities
ID
20737:Part3.1_beams 1
20737:Part3.1-beam1 1
20737:Part3.1-beam2 2
20737:Part3.1-beam3 3
20737:Part3.1-beam4 4
20737:Part3.1-beam5 5
20737:Part3.1-beam6 6
20737:Part3.1-beam7 7
20737:Part3.1-beam8 8
20737:Part3.1-beam9 9
20737:Part3.1-beam10 10
20737:Part3.1-beam11 11
20737:Part3.1-beam12 12
20737:Part3.1-beam13 13
20737:Part3.1-beam14 14
20737:Part3.1-beam15 15
20737:Part3.1-beam16 16
20737:Part3.1-beam17 17
20737:Part3.1-beam18 18
Point Y Value Z Value
1 -2.582848 8.007243
2 -0.586771 8.320997
3 -0.147894 8.217959
4 1.027667 0.732819
5 0.641703 0.499589
6 -1.354371 0.185817
7 -1.305470 -0.125469
Y
Z
10.0000
Data
Results
Area = 4.3041169
Centroid :
Local
Yc = 0.1068154
Zc = 4.4227225
Moments Of Inertia :
Local
IY = 126.7896483
IZ = 3.6834537
IYZ = -4.2415044
Centroidal
Iy = 42.5990819
Iz = 3.6343458
Iyz = -6.2748334
Principal
Iv = 43.5846448
Iw = 2.6487829
Angle = 0.1557932
Polar = 46.2334277
Radius of Gyration = 0.7844787
Torsional Constant = 0.1734615
Warping Constant = 31.9056642
Shear center :
Local
Ys = 1.4029176
Zs = 4.6266697
Principal
Vs = 1.3120500
Ws = 0.0003691
Shear deform coeff
Ay = 4.4509256
Az = 1.8326471
Ayz = 0.4240256
Principal Shear Coeff
AV = 4.5178835
AW = 1.7656893
Shear factors
Ky = 0.2297363
Kz = 0.5579574
Kyz = -0.0531548