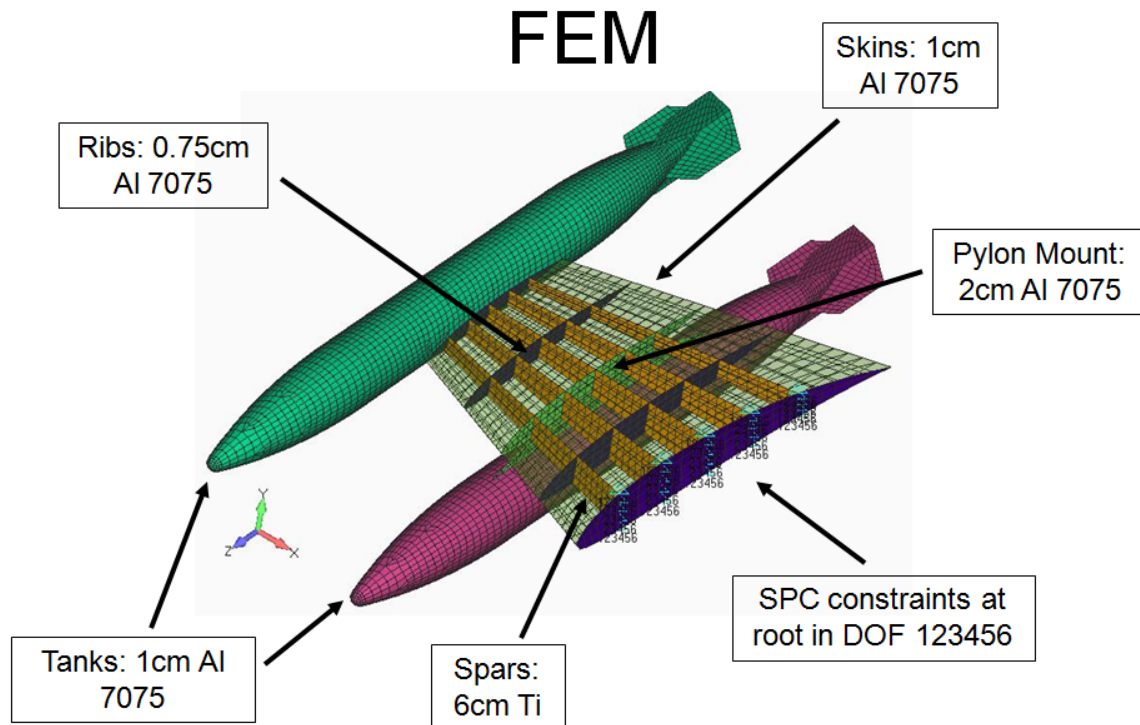


F-104 Wing Structure Design Using FEA

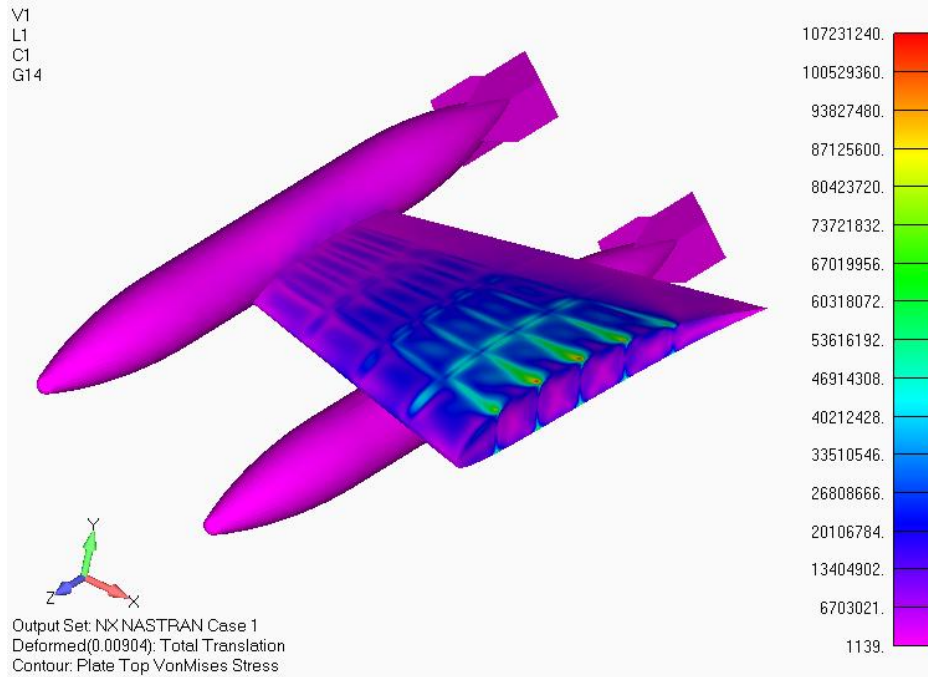
William VonHagen (AE, Class of 2009)
Dan Galbraith (AE, Class of 2009)



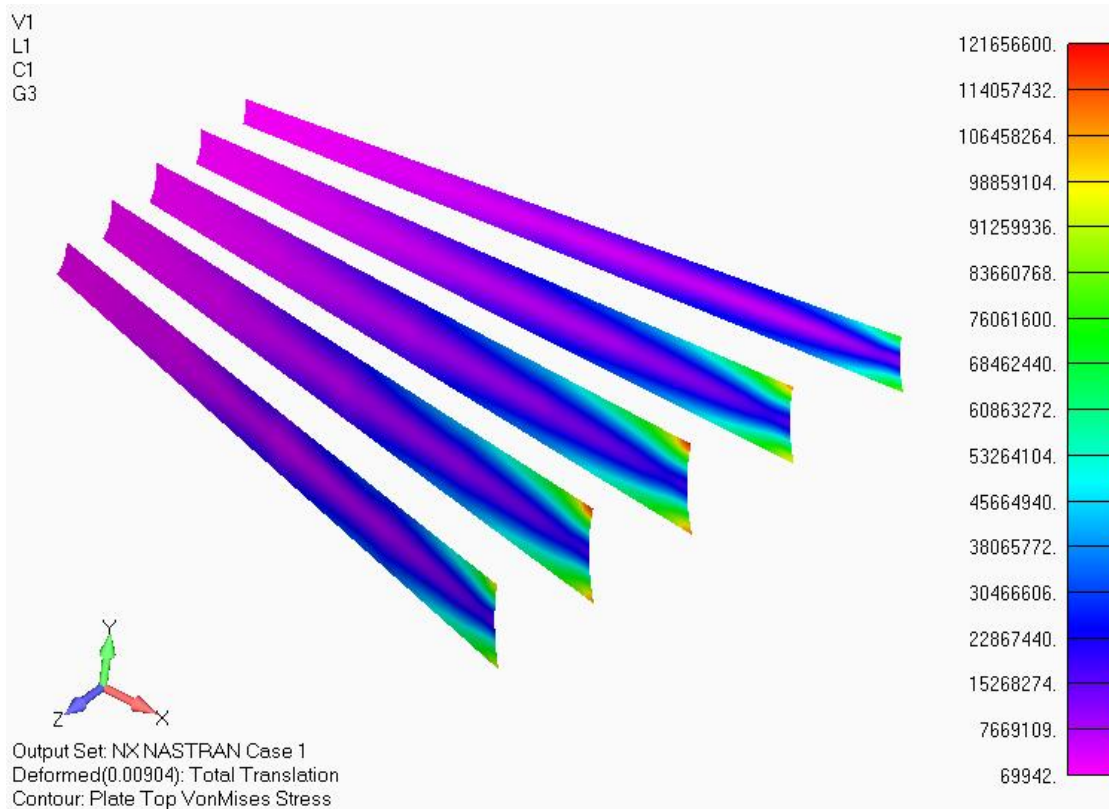
Lockheed F-104 Starfighter in flight (Only tip tanks are attached)



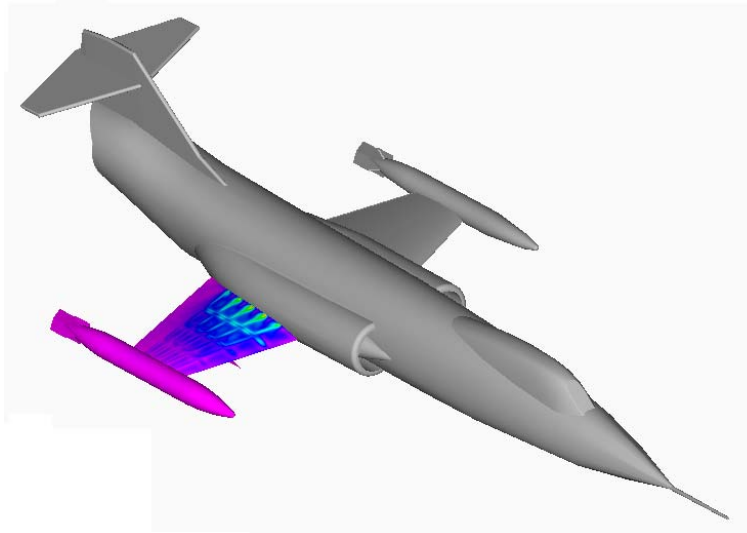
Finite element model of the F-104 Starfighter wing showing final materials, thicknesses, and root constraints



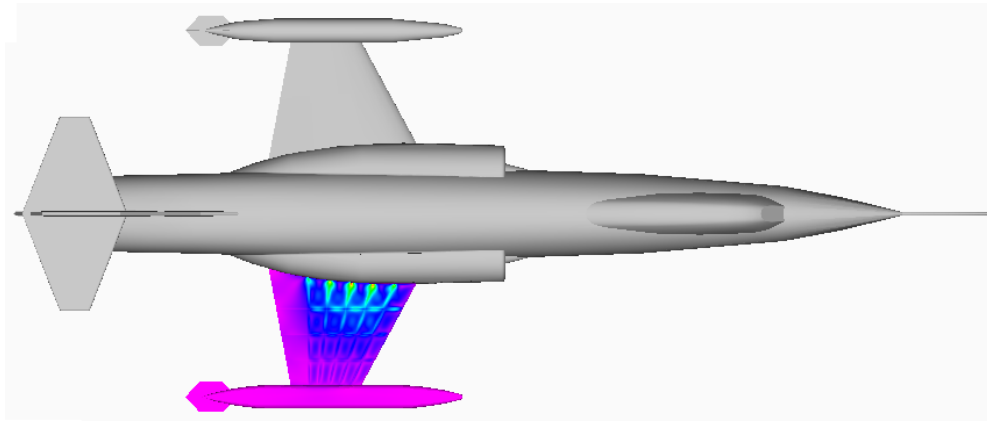
Static von Mises stress contour in the Aluminum 7075 components at 8g wing loading



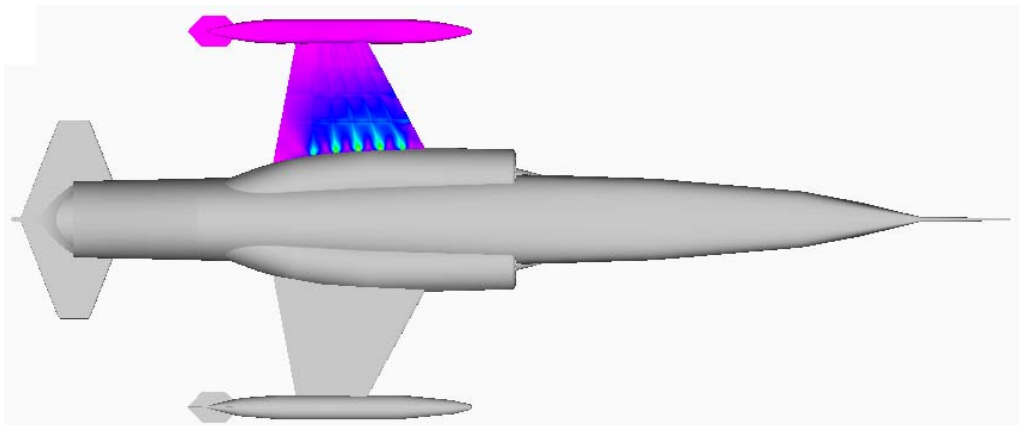
Static von Mises stress contour in the Titanium components at 8g wing loading



Stress contour of starboard wing at 8g wing load– isometric view

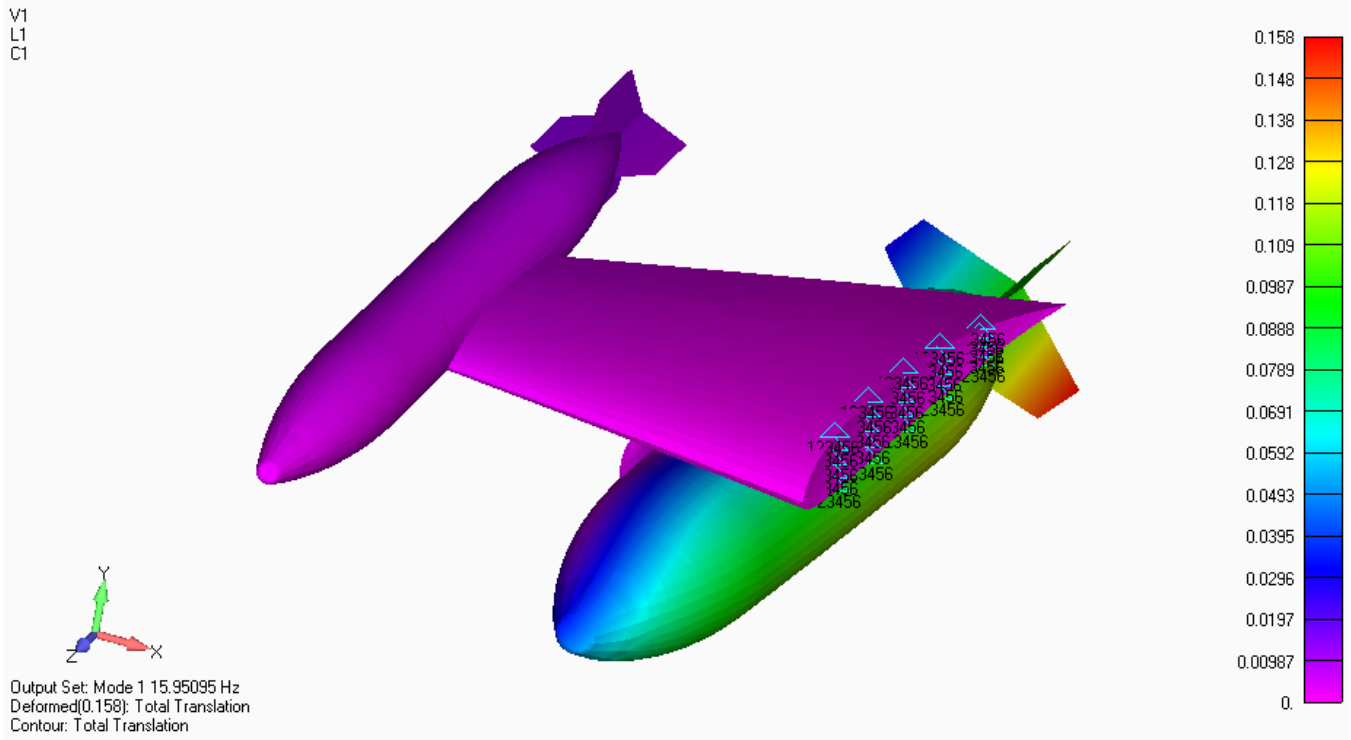


Stress contour of starboard wing at 8g wing load – top view



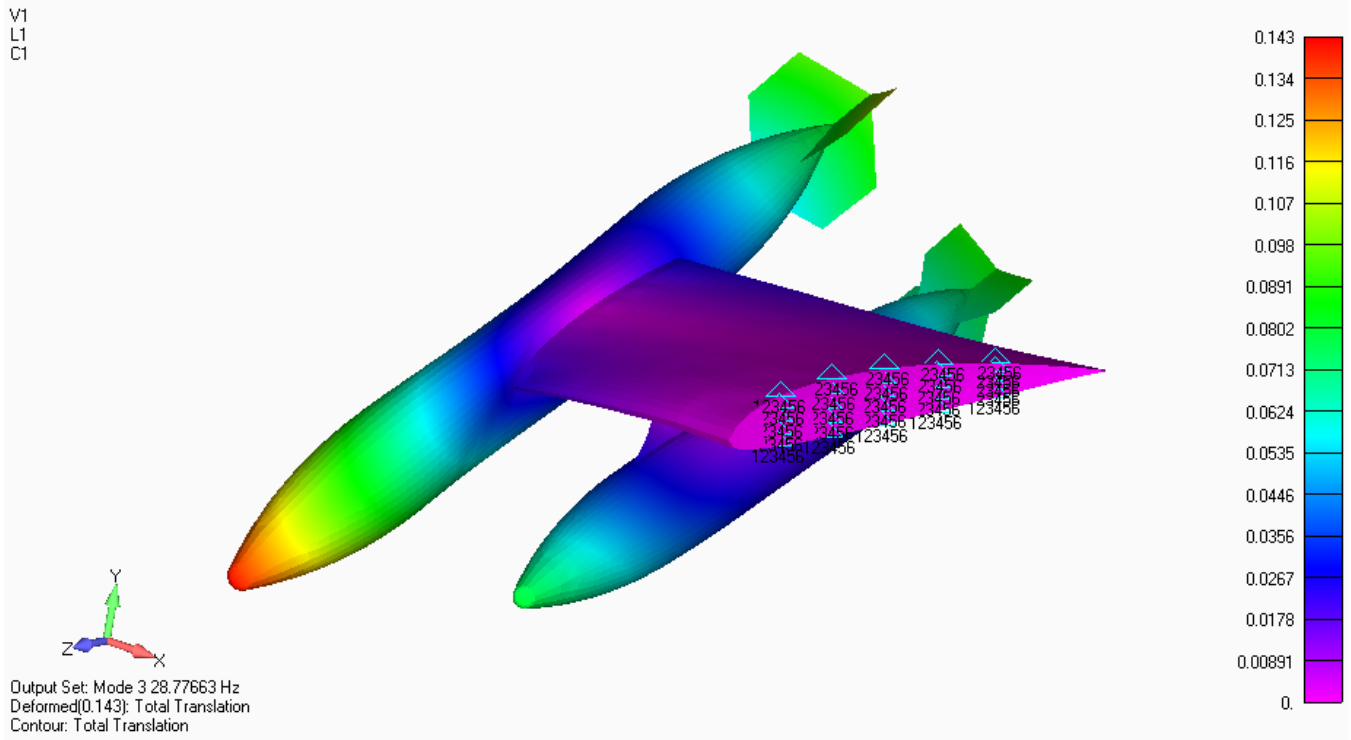
Stress contour of starboard wing at 8g wing load – bottom view

V1
L1
C1

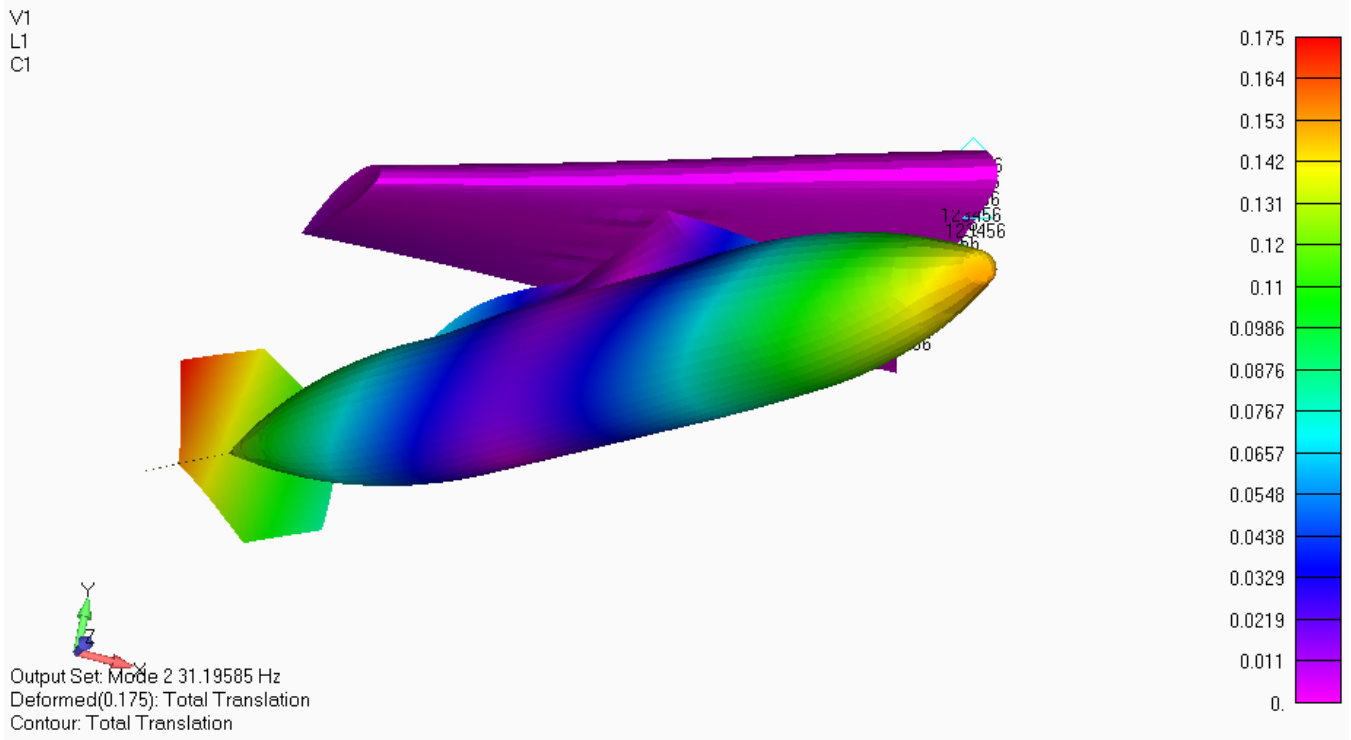


Mode #1 of the tip + mid-span tanks configuration (15.95 Hz, pylon mount bending)

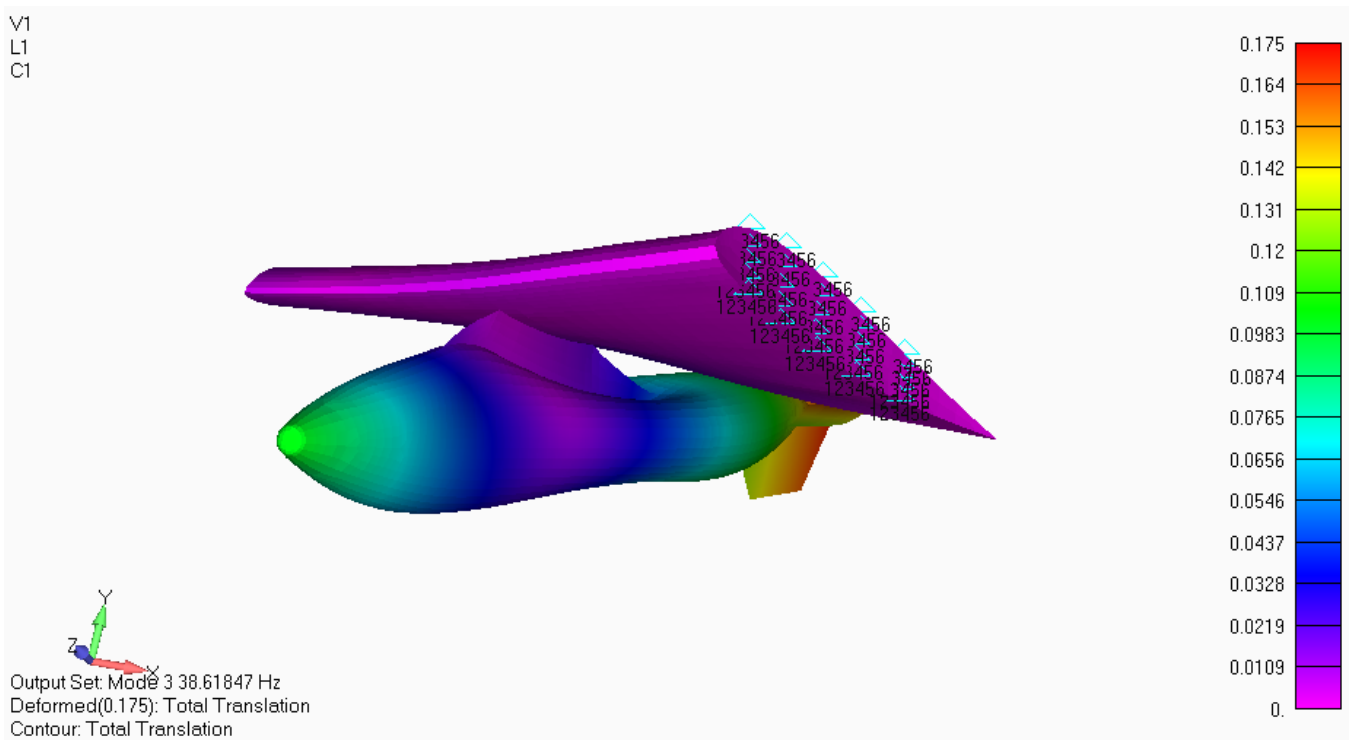
V1
L1
C1



Mode #3 of the tip + mid-span tanks configuration (28.78 Hz, wing torsion)

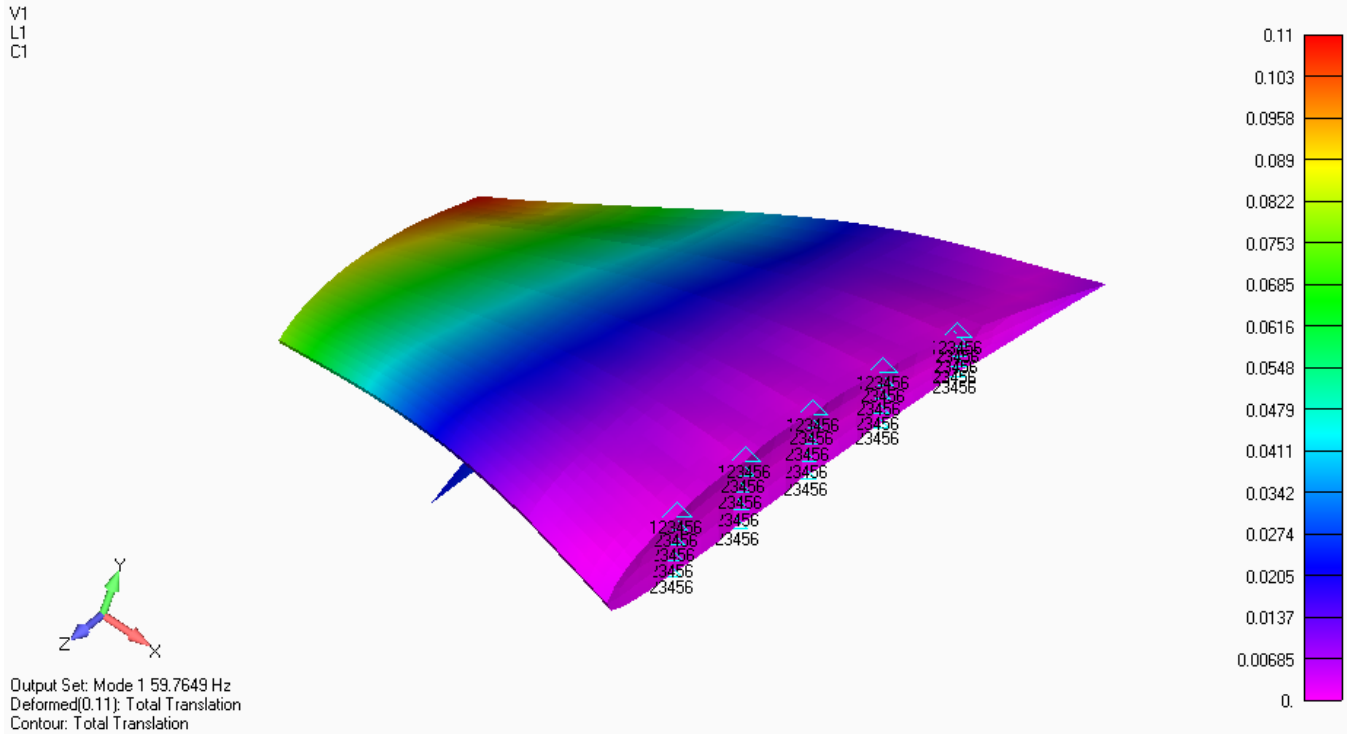


Mode #2 of the mid-span tank configuration (31.20 Hz, pylon mount twisting)



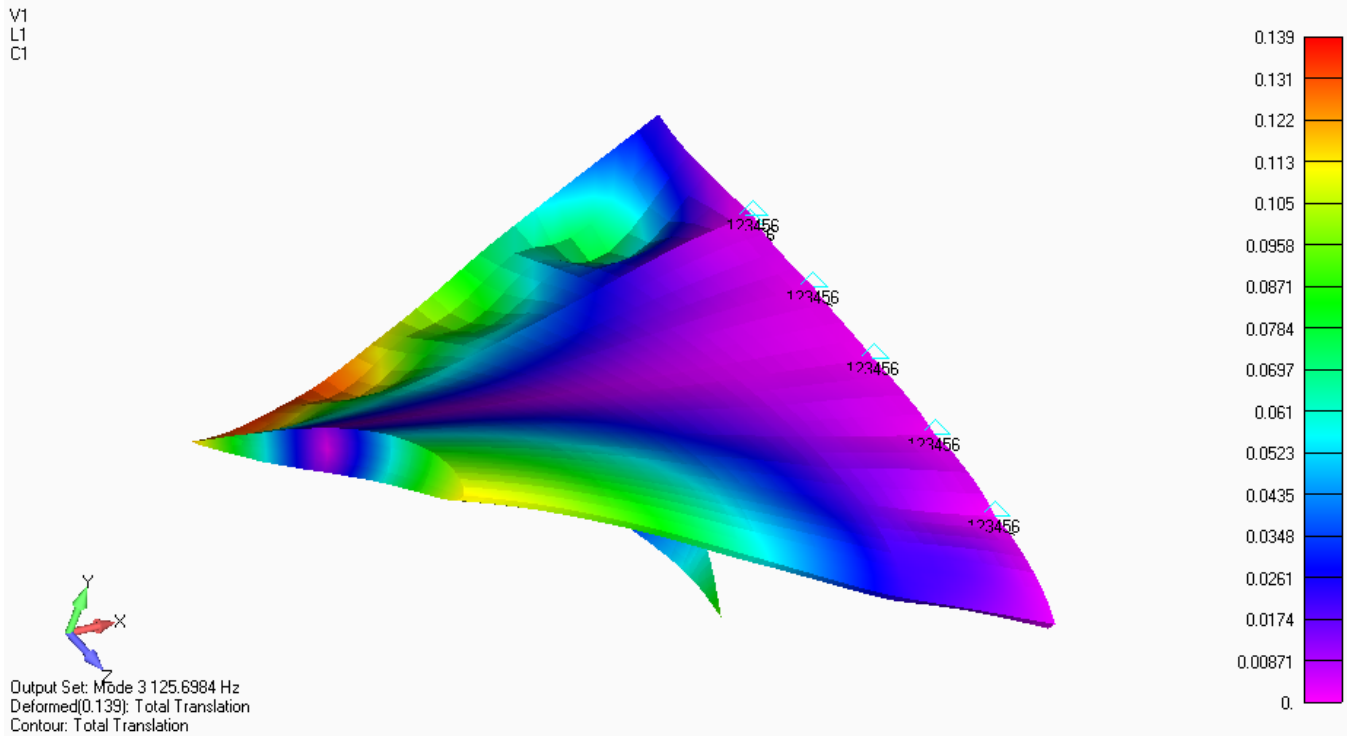
Mode #3 of the mid-span tank configuration (38.62 Hz, wing torsion + tank deformation)

V1
L1
C1



Mode #1 of the no tanks configuration (59.76 Hz, wing cantilever mode)

V1
L1
C1



Mode #3 of the no tanks configuration (125.70 Hz, wing torsion)