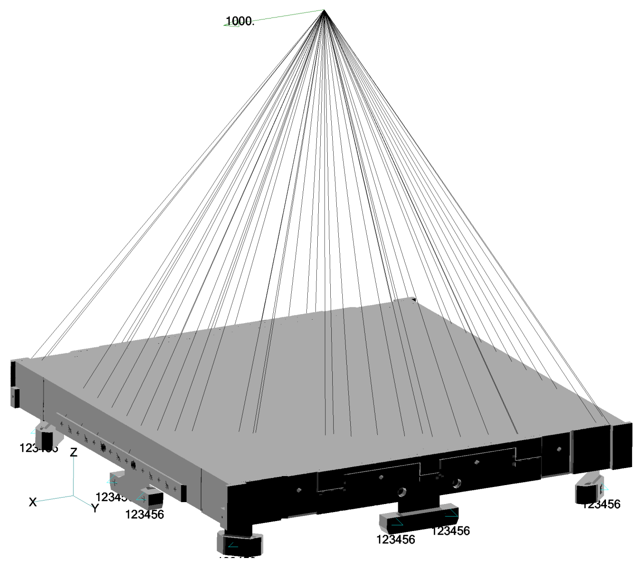
Bottom Tray Buckling - Using the "Detailed" Bottom Tray FEM:

Assembly View of Buckling Analysis Model:

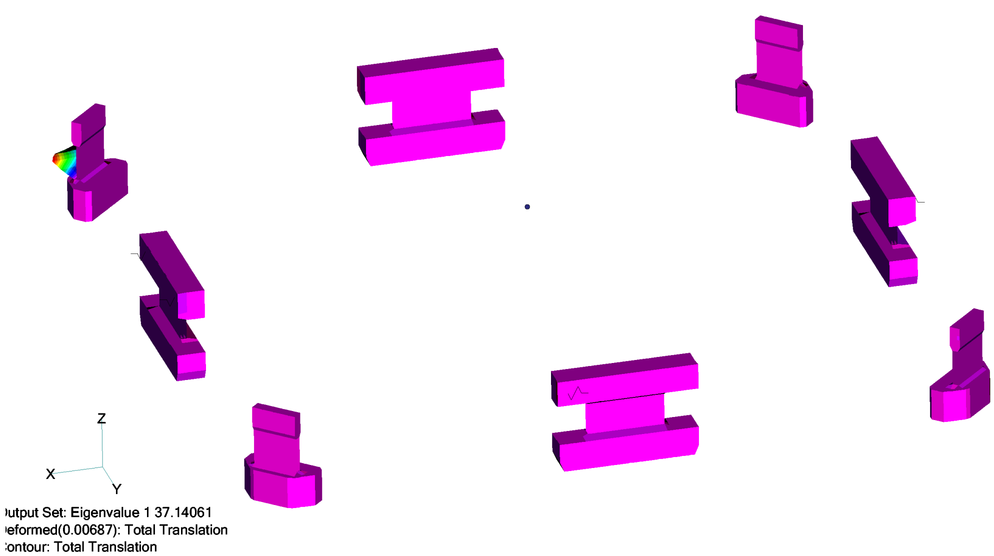
Loading Applied at Static Test Location representing effective CG of Tower



Applied Load at Effective CG Location:

$$F_{applied} := 1000N$$

Results of Buckling Analysis:



First Buckling Eigenvalue (from NASTRAN Run):

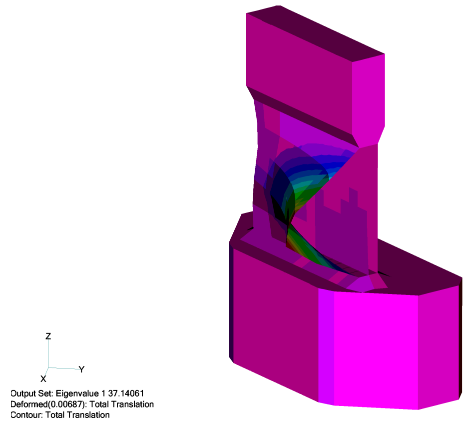
$$Eigenvalue_1 := 37.14$$

Buckling Results Cont.

Buckling Capability of Bottom Tray Assembly:

$$F_{b\_capability} := F_{applied} \cdot Eigenvalue_1$$

$$F_{b\_capability} = 37140\ \mathrm{N}$$



Eigenvalue= 37.14

Capability In terms of G's:

$$Wt_{tower} := 32.48\mathrm{kg}$$

$$G_{buckling\_assy} := \frac{F_{b\_capability}}{Wt_{tower}} \qquad G_{buckling\_assy} = 116.6\ \mathrm{g}$$

Maximum Expected G's during Random Vibe in Lateral Direction:

$$G_{max} := 27\mathrm{g}$$

Margin of Safety to Buckling:

$$MS_{buckling\_assy} := \frac{G_{buckling\_assy}}{G_{max} \cdot 1.4 \cdot 1.15} - 1 \qquad \boxed{MS_{buckling\_assy} = 1.68}$$

The Side Flexure Buckling is not shown to be the critical buckling mode , also only the first 3 buckling modes were run due to the long run time for solving a buckling solution with 700,000 DOF model.

To determine the Side Flexure Buckling capability a detailed small model was used and the Maximum Loads at the Side Flexure from the Random Analysis were applied.

Side Flexure Buckling - Indiviual Bracket FEM:

Maximum Loading on Flexure RV in Y :

$$F_{normal} := 23N$$

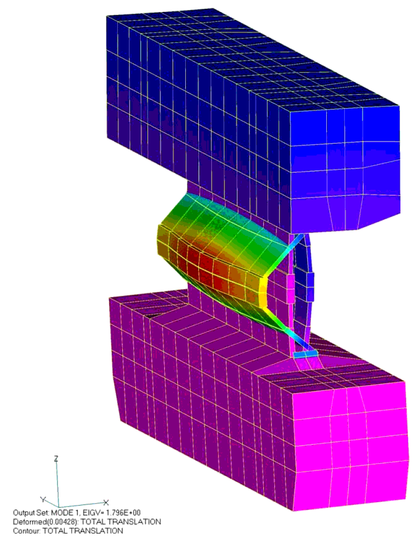
$$F_z := -1668N$$

$$Eigenvalue := 12.36$$

$$MS_{RV\_Y} := \frac{Eigenvalue}{1.4 \cdot 1.15} - 1$$

$$\boxed{MS_{RV\_Y} = 6.68}$$

RV Loading in Y

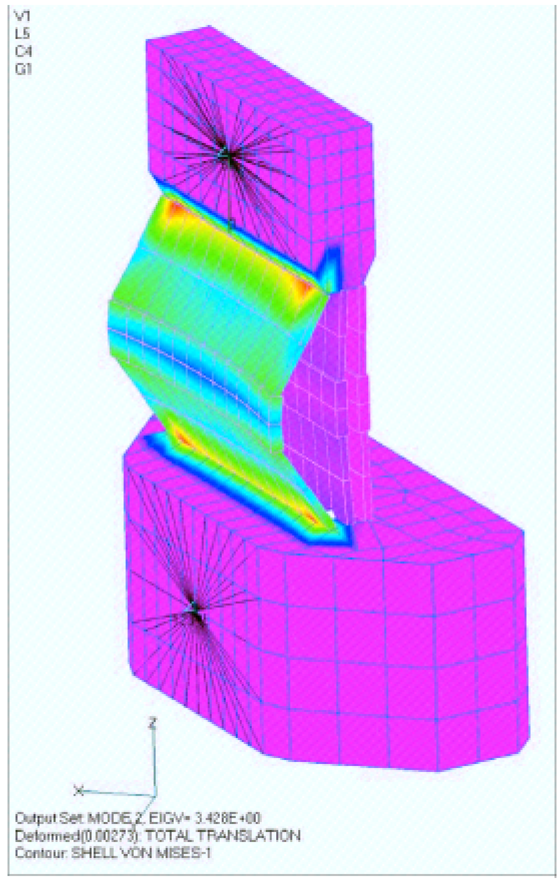


This is with the Side Flexure Constrained in rotations at the Close-out Interface.

BUCKLING ANALYSIS - Maximum Compression Load combined with offset of .014 inches.

An analysis was run with an enforced displacement of .014 inches due to an offset from mis-alignment

The view to the right shows the buckling mode for the first eigenvalue when under compression and combined with the ,014 inch offset.



The first eigenvalue is:

$F1 := 3.428$

this is smaller than the Eigenvalue of 5.14 without the enforced displacement.

$$MS_{corner} := \frac{F1}{1.4 \cdot 1.15} - 1$$

For the Corner Bracket:

$MS_{corner} = 1.129$

For the Side Flexure:

$Eigenvalue_{enf\_displ} := 2.46$

$$MS_{side} := \frac{Eigenvalue_{enf\_displ}}{1.4 \cdot 1.15} - 1$$

$MS_{side} = 0.53$

Summary of Analysis Margins:

Corner Bracket: Min MS is when the Enforced Displacements are applied $MS_{min} := 1.13$

Side Flexure: The unconstrained condition is a worst case scenario, the full assembly model shows that the minimum MS is at the Corner Bracket, $MS_{side} = 0.53$

These Margins are worst case, when modelling a flexure by itself, they are sensitive to the boundary conditions.