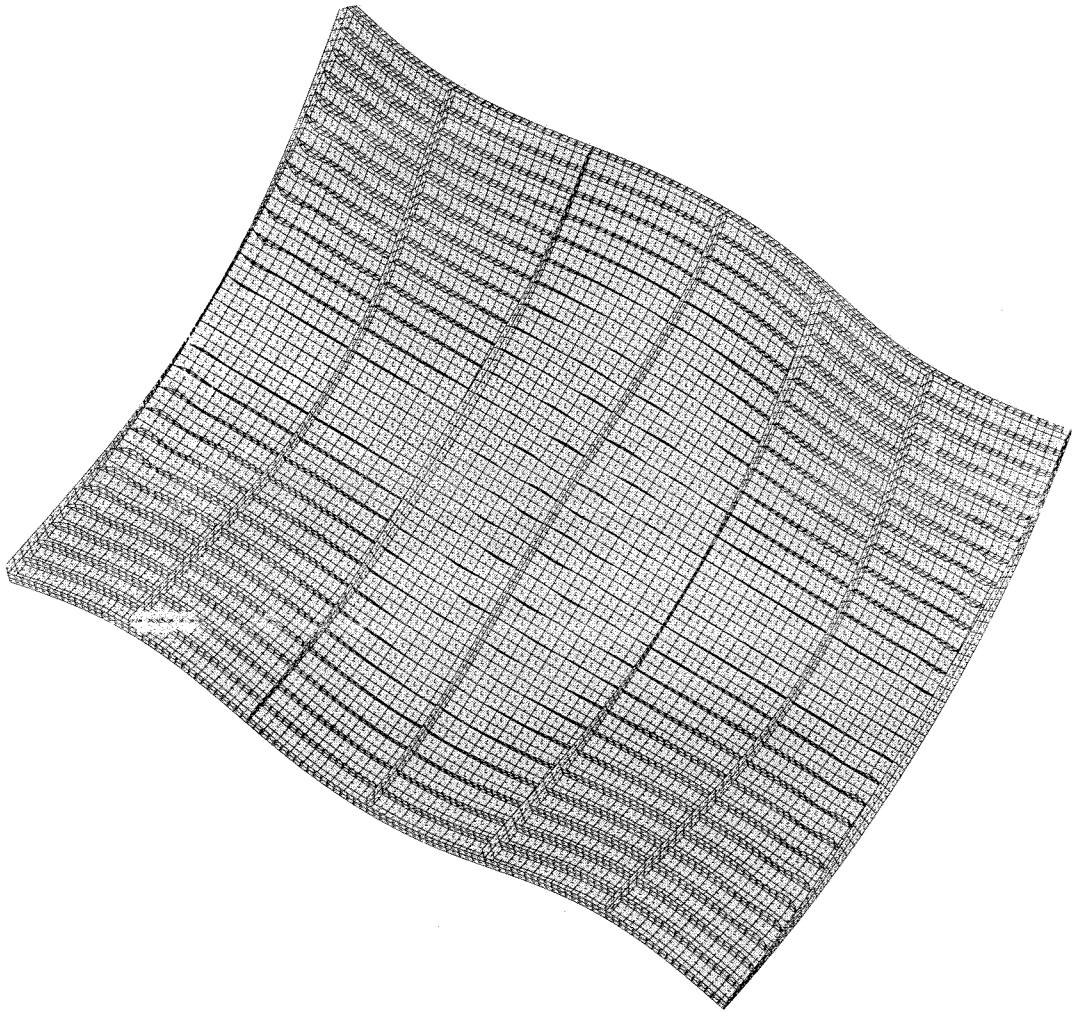
$w_{imp} = -0.125"$



solution scale = 0.2778E+02

PA= 1.00000E+00 PB= 0.00000E+00 PX= 0.00000E+00

step 8 displacement deformed geometry

STAGS model: nonlinear deformation, same view as linear buckling modes

Θ x -35.84
Θ y -179.86
Θ z 35.63

1.336E+01

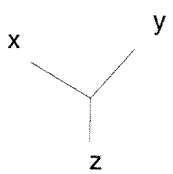
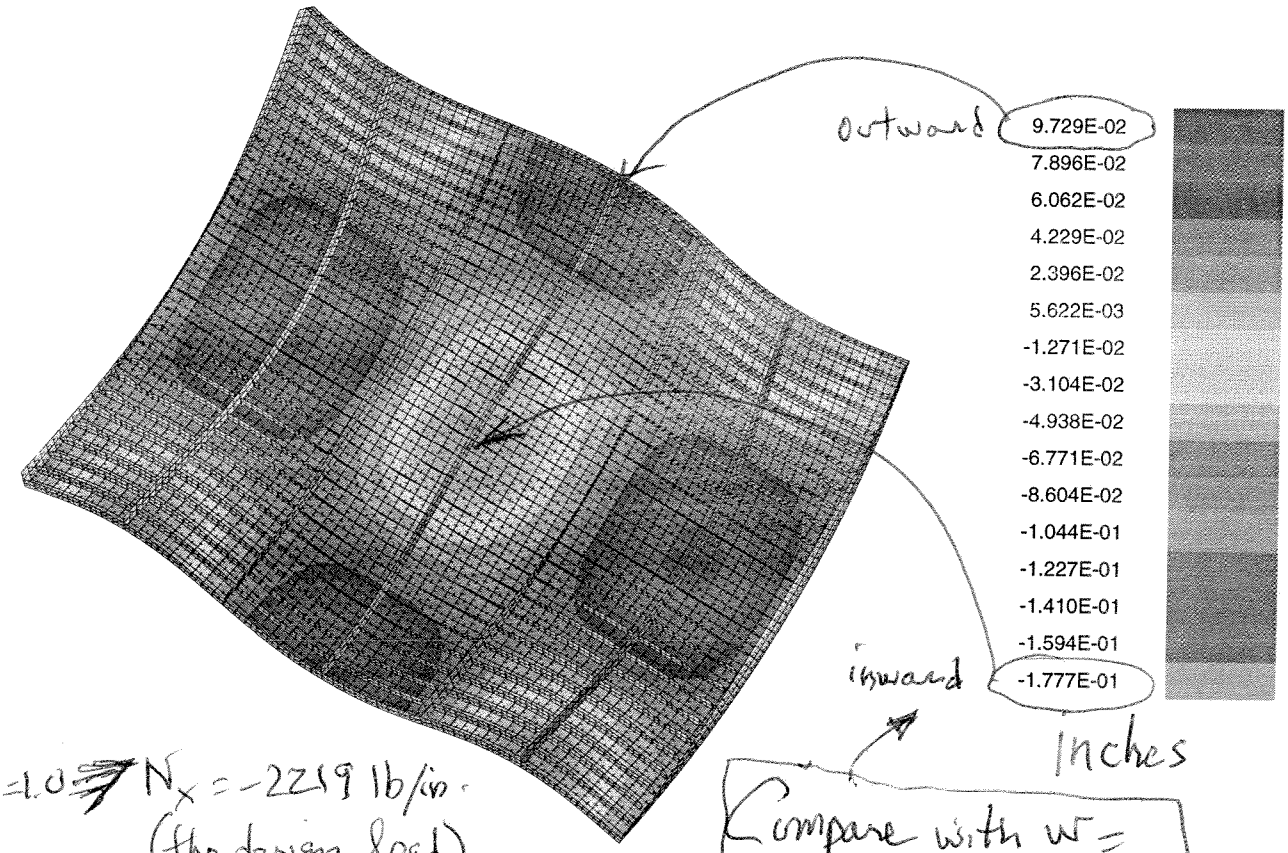


Fig. 50

Normal displacement, w

$w_{imp} = -0.125"$



PA = 1.0 ⇒ $N_x = -2219$ lb/in.
(the design load)

Compare with $w = \pm 0.1557"$ in PANDA2.
(see p. A11 in Appendix Z)

solution scale = 0.2778E+02
PA= 1.00000E+00 PB= 0.00000E+00 PX= 0.00000E+00
step 8 displacement w contours
nonlinear w same view as linear buckling mode
Minimum value = -1.77712E-01, Maximum value = 9.72892E-02

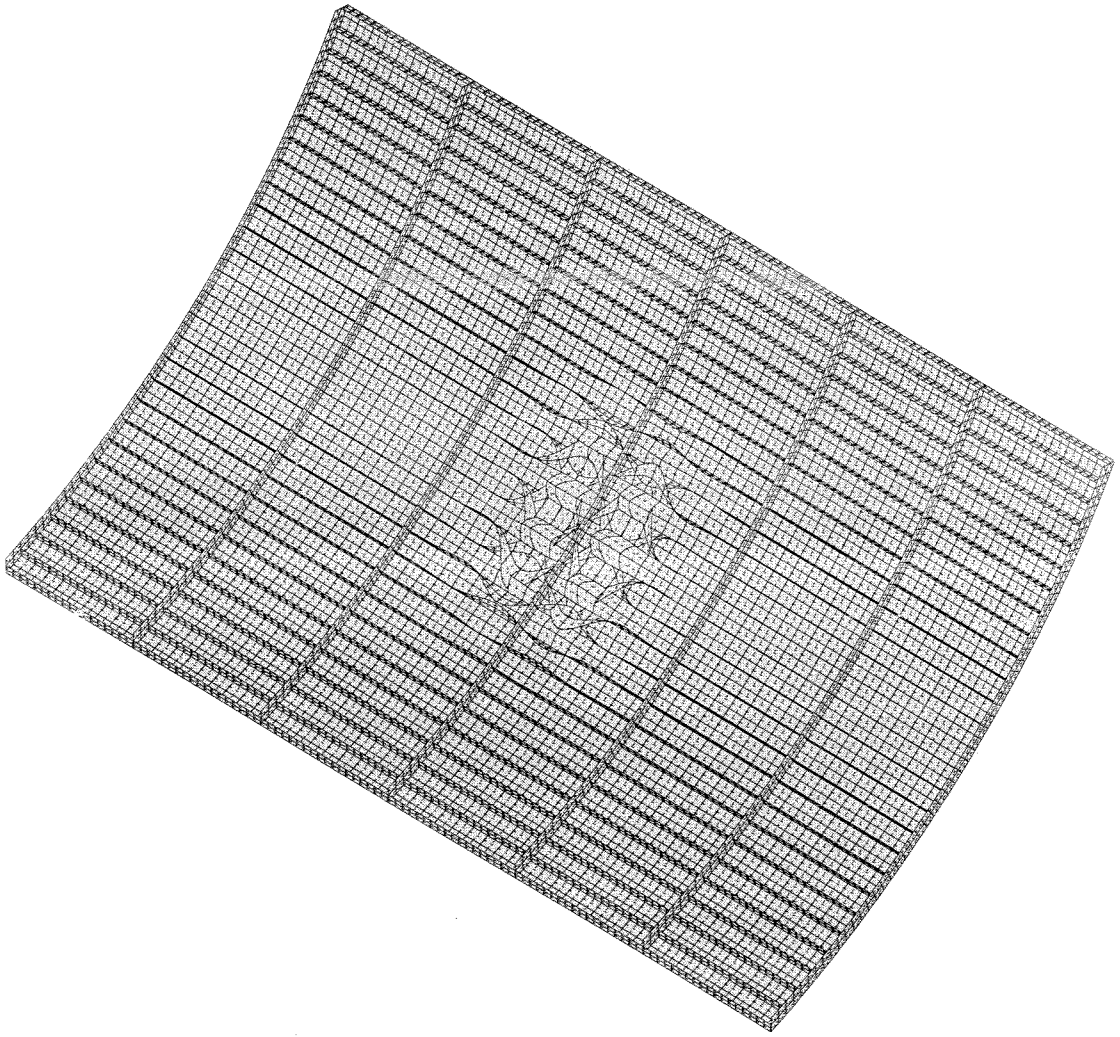
Θ x -35.84
Θ y -179.86
Θ z 35.63

1.603E+01

Fig. 51

$w_{imp} = -0.125"$

Nonlinear buckling at Step 8



solution scale = 0.4615E+01
mode 1, pcr = 0.10729E+01
step 8 eigenvector deformed geometry
nonlinear buckling of imperfect shell from STAGS

Θ x -35.84
Θ y -179.86
Θ z 35.63

1.336E+01

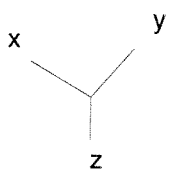
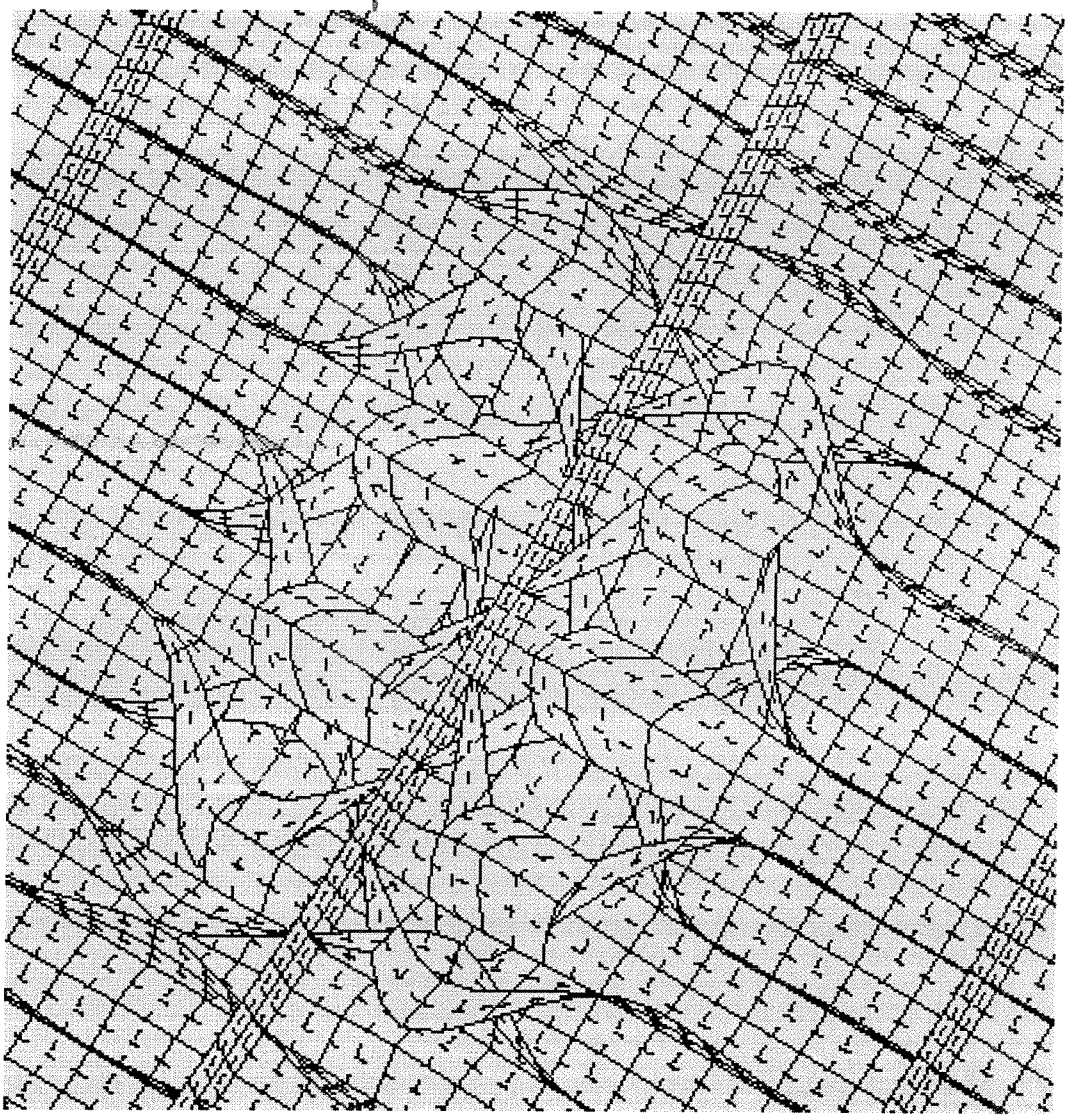


Fig. 52

$W_{imp} = -0.125''$



Enlarged view of previous Fig.

Fig. 53

Table 55 hasortho.out2 (abridged, nonlinear theory)

2nd & 3rd STAGS nonlinear runs. Wimp = -0.125"

```
Output from STAGS for nonlinear runs with NEGATIVE
general buckling modal imperfection, Wimp = 0.125 inch
================================================================
Imperfections used in the nonlinear run:
C Begin B-4, B-5 input data, if any...
 -0.125    0  1  1    $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN(genimpfig46)
  0.001    0  1  3    $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN(interrngimpfig35)
  0.0005   0  5  5    $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN (localimpfig49)
----------------------------------------------------------
```

2nd nonlinear run with Wimp = -0.125 inch:

(lines skipped to save space)

CONVERGENCE HAS BEEN OBTAINED FOR EIGENVALUES 1 THROUGH 4

		CRITICAL LOAD FACTOR COMBINATION		
NO.	EIGENVALUE	LOAD SYSTEM A	LOAD SYSTEM B	@DOF
1	4.649896E-02	1.130219E+00	0.000000E+00	78777
2	4.655220E-02	1.130276E+00	0.000000E+00	137025
3	4.662377E-02	1.130354E+00	0.000000E+00	76857
4	4.662436E-02	1.130354E+00	0.000000E+00	138945

(lines skipped to save space)

LIST OF LOAD STEPS AND LOAD FACTORS

STEP	PA	PB	PX
8	0.100000E+01	0.000000E+00	
9	0.102720E+01	0.000000E+00	
10	0.106082E+01	0.000000E+00	
11	0.108000E+01	0.000000E+00	

3rd nonlinear run with Wimp = -0.125 inch:

0 CONVERGENCE CRITERION HAS NOT BEEN SATISFIED FOR EIGENVALUES 1 THROUGH 4

		CRITICAL LOAD FACTOR COMBINATION		
NO.	EIGENVALUE	LOAD SYSTEM A	LOAD SYSTEM B	@DOF
1	4.088906E-02	1.176205E+00	0.000000E+00	31719
2	4.321990E-02	1.178838E+00	0.000000E+00	139017
3	4.328369E-02	1.178911E+00	0.000000E+00	76785
4	4.361207E-02	1.179282E+00	0.000000E+00	136953

(lines skipped to save space)

LIST OF LOAD STEPS AND LOAD FACTORS

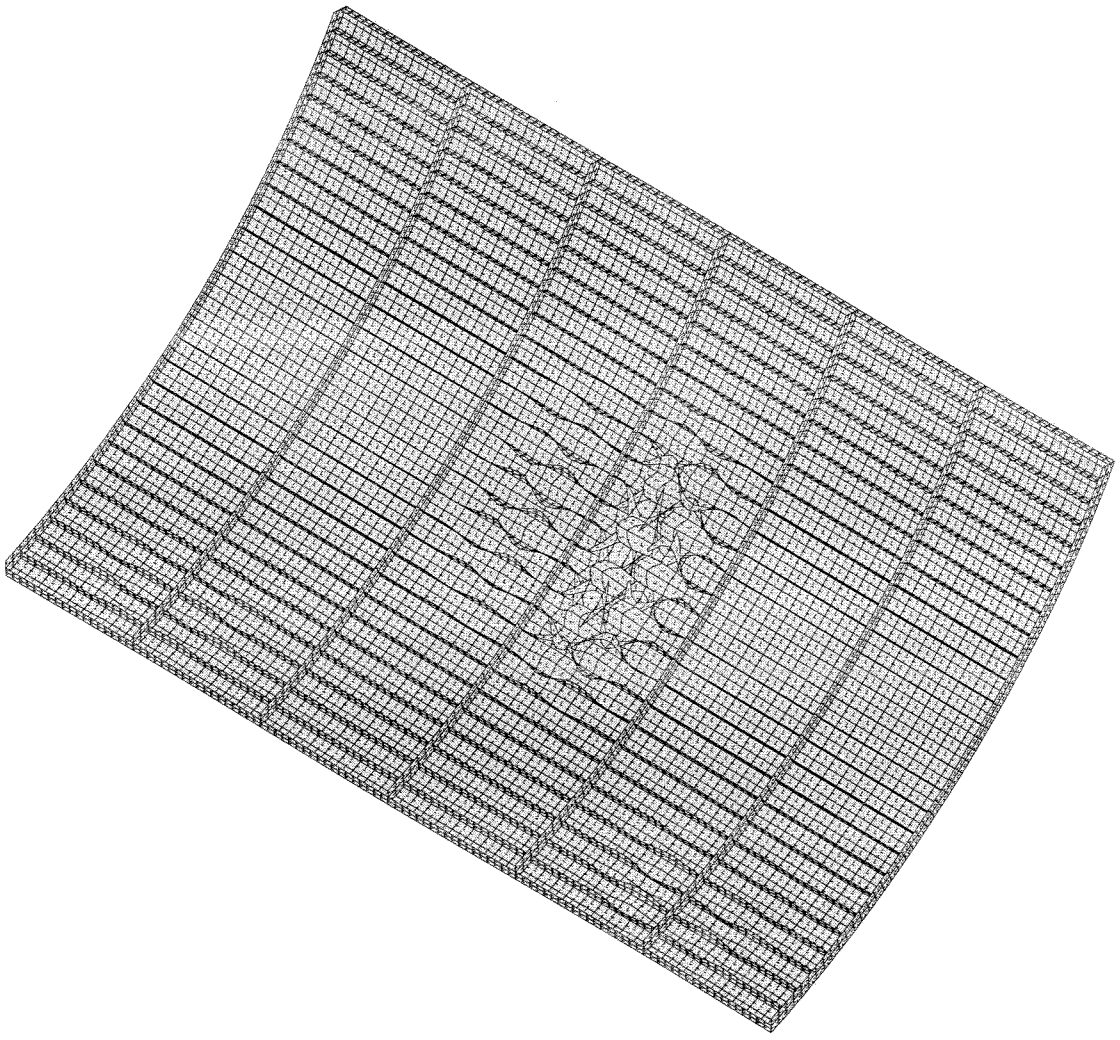
STEP	PA	PB	PX
11	0.108000E+01	0.000000E+00	
12	0.108187E+01	0.000000E+00	
13	0.108467E+01	0.000000E+00	
14	0.109022E+01	0.000000E+00	
15	0.110115E+01	0.000000E+00	
16	0.112090E+01	0.000000E+00	
17	0.113000E+01	0.000000E+00	

==========

See Fig. 54

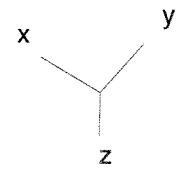
Wimp = -0.125"

Nonlinear buckling at Step 17



solution scale = 0.4234E+01
mode 1, pcr = 0.11762E+01
step 17 eigenvector deformed geometry
nonlinear buckling of imperfect shell from STAGS

Θ x -35.84
Θ y -179.86
Θ z 35.63



1.336E+01

Fig. 54

Table 56(2pp) nasaortho.out2 (abridged, nonlinear) Wimp = -0.125"

2nd – 4th STAGS nonlinear runs.

```
Output from STAGS for nonlinear runs with NEGATIVE
general buckling modal imperfection, Wimp = 0.125 inch
================================================================
Imperfections used in the nonlinear run:
C Begin B-4, B-5 input data, if any...
 -0.125    0  1  1    $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN(genimpfig46)
  0.001    0  1  3    $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN(interrngimpfig35)
  0.0005   0  5  5    $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN (localimpfig49)
----------------------------------------------------------

2nd nonlinear run with Wimp = -0.125 inch:

(lines skipped to save space)

 CONVERGENCE HAS BEEN OBTAINED FOR EIGENVALUES  1 THROUGH   4
                    CRITICAL LOAD FACTOR COMBINATION
   NO.     EIGENVALUE    LOAD SYSTEM A  LOAD SYSTEM B    @DOF
     1   4.649896E-02   1.130219E+00   0.000000E+00   78777
     2   4.655220E-02   1.130276E+00   0.000000E+00  137025
     3   4.662377E-02   1.130354E+00   0.000000E+00   76857
     4   4.662436E-02   1.130354E+00   0.000000E+00  138945

(lines skipped to save space)

 LIST OF LOAD STEPS AND LOAD FACTORS
 STEP       PA             PB             PX
    8  0.100000E+01  0.000000E+00
    9  0.102720E+01  0.000000E+00
   10  0.106082E+01  0.000000E+00
   11  0.108000E+01  0.000000E+00
----------------------------------------------------------------------

3rd nonlinear run with Wimp = -0.125 inch:

 CONVERGENCE CRITERION HAS NOT BEEN SATISFIED FOR EIGENVALUES   1 THROUGH   4
                    CRITICAL LOAD FACTOR COMBINATION
   NO.     EIGENVALUE    LOAD SYSTEM A  LOAD SYSTEM B    @DOF
     1   4.088906E-02   1.176205E+00   0.000000E+00   31719
     2   4.321990E-02   1.178838E+00   0.000000E+00  139017
     3   4.328369E-02   1.178911E+00   0.000000E+00   76785
     4   4.361207E-02   1.179282E+00   0.000000E+00  136953

(lines skipped to save space)

 LIST OF LOAD STEPS AND LOAD FACTORS
 STEP       PA             PB             PX
   11  0.108000E+01  0.000000E+00
   12  0.108187E+01  0.000000E+00
   13  0.108467E+01  0.000000E+00
   14  0.109022E+01  0.000000E+00
   15  0.110115E+01  0.000000E+00
   16  0.112090E+01  0.000000E+00
   17  0.113000E+01  0.000000E+00
----------------------------------------------------------------------

4th nonlinear run with Wimp = -0.125 inch:

 BEGIN ITERATIONS FOR LOAD STEP    31,  DETA=   0.281785E-02,   PA=  0.127892E+01,   PB=  0.0000»
00E+00
 ITERATION      RNORM          DNORM0           PA          ENERGY        DOF      RESIDUAL      »
 DETRM
     EXP NEGRT       RFACT
         1   0.100847E-03   0.375918E-03   0.127890E+01   0.157869E+05 136869   0.492093E+00   0»
.834594E+01
  705443      0   0.1000E+01
         2   0.123468E-03   0.487984E-03   0.127888E+01   0.157863E+05 136869   0.590228E+00   0»
.709133E+01
  705443      0   0.1000E+01
         3   0.173690E-03   0.741332E-03   0.127885E+01   0.157856E+05 136869   0.788041E+00   0»
.581257E+01
  705443      0   0.1000E+01

 CONVERGENCE HAS NOT BEEN OBTAINED.
 MAXIMUM NO. OF STEP CUTS =     10 REACHED.

(lines skipped to save space)

 CONVERGENCE HAS BEEN OBTAINED FOR EIGENVALUES  1 THROUGH   4
```

Same as Table 55

Table 56 (p. 2 of 2)

CRITICAL LOAD FACTOR COMBINATION

NO.	EIGENVALUE	LOAD SYSTEM A	LOAD SYSTEM B	@DOF
1	9.363856E-03	1.290851E+00	0.000000E+00	6501
2	1.145103E-02	1.293520E+00	0.000000E+00	5925
3	2.451279E-02	1.310225E+00	0.000000E+00	64809
4	2.586401E-02	1.311953E+00	0.000000E+00	63399

(lines skpped to save space)

LIST OF LOAD STEPS AND LOAD FACTORS

STEP	PA	PB	PX
17	0.113000E+01	0.000000E+00	
18	0.113092E+01	0.000000E+00	
19	0.113230E+01	0.000000E+00	
20	0.113505E+01	0.000000E+00	
21	0.114052E+01	0.000000E+00	
22	0.115110E+01	0.000000E+00	
23	0.116528E+01	0.000000E+00	
24	0.118290E+01	0.000000E+00	
25	0.119962E+01	0.000000E+00	
26	0.121937E+01	0.000000E+00	
27	0.124255E+01	0.000000E+00	
28	0.126716E+01	0.000000E+00	
29	0.127439E+01	0.000000E+00	
30	0.127888E+01	0.000000E+00	

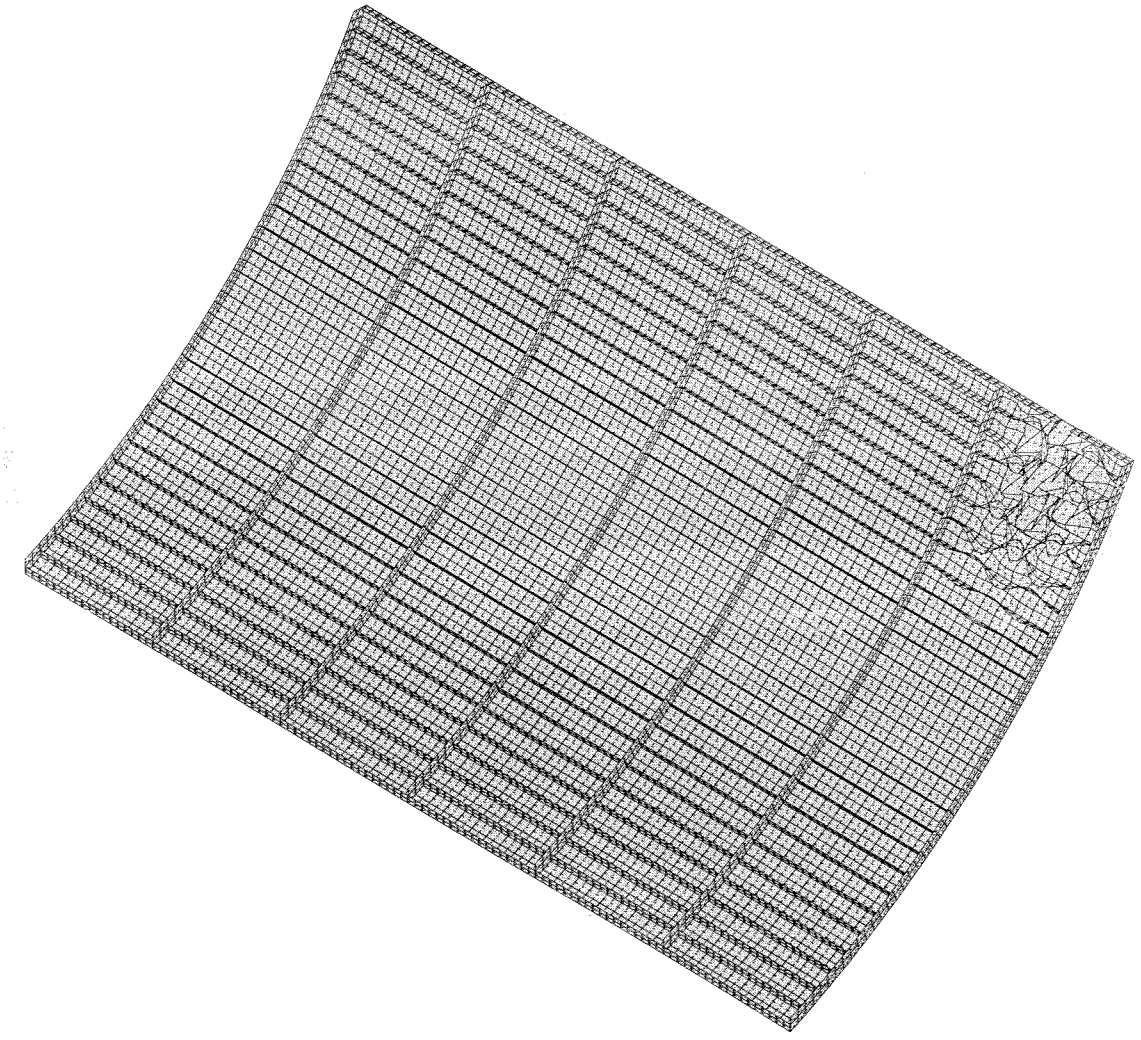
Fig. 55

Figs. 56-60

$w_{imp} = -0.125''$

Wimp = −0.125"

Nonlinear buckling at Step 30



solution scale = 0.4693E+01
mode 1, pcr = 0.12909E+01
step 30 eigenvector deformed geometry
nonlinear buckling of imperfect shell from STAGS

Θ x -35.84
Θ y -179.86
Θ z 35.63

1.336E+01

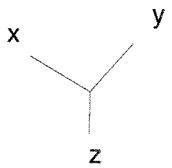
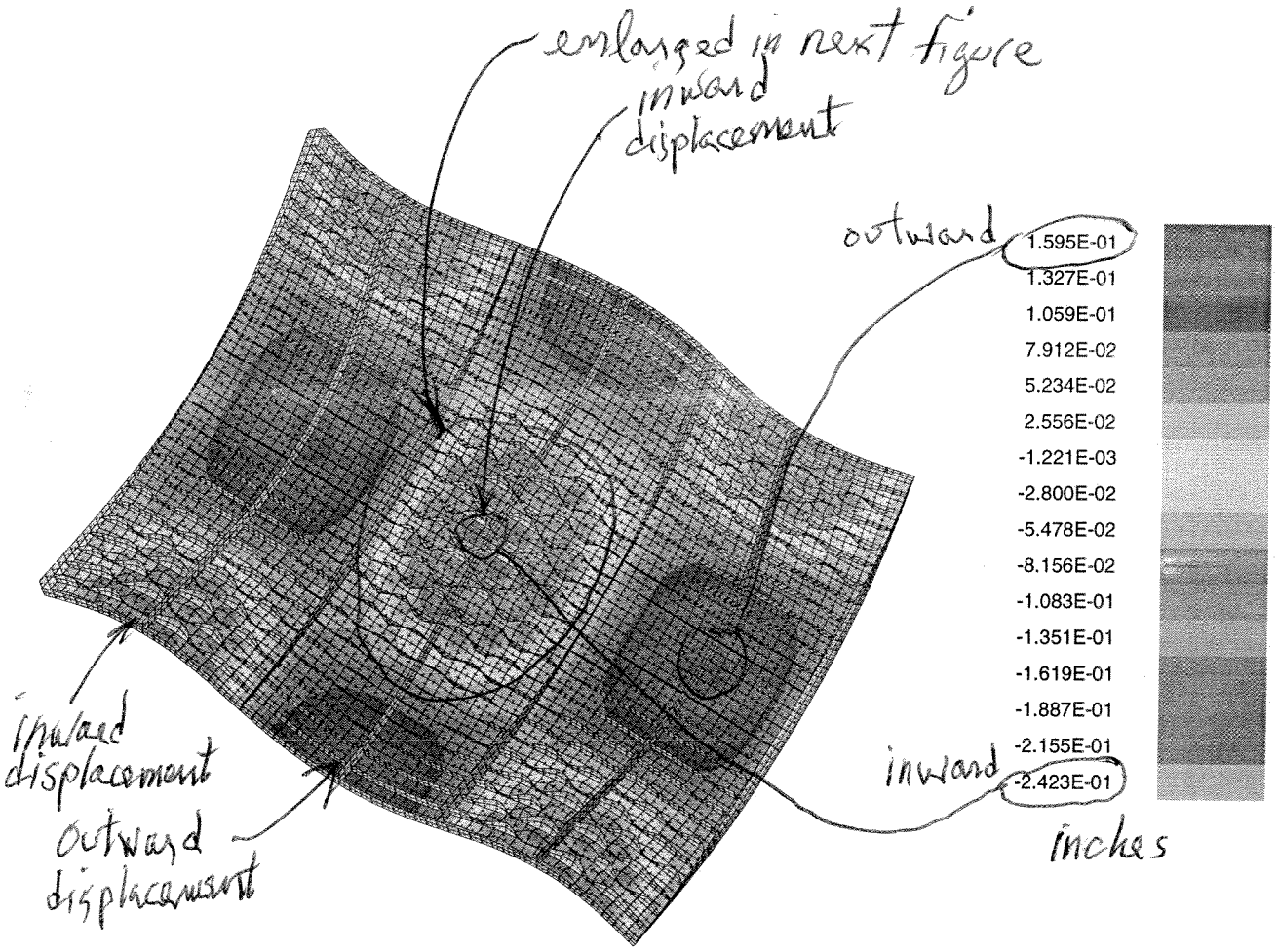


Fig. 55

$w_{imp} = -0.125"$



solution scale = 0.1635E+02

PA= 1.27888E+00 PB= 0.00000E+00 PX= 0.00000E+00

step 30 displacement w contours

nonlinear w same view as linear buckling mode

Minimum value = -2.42250E-01, Maximum value = 1.59465E-01

Θ x -35.84
Θ y -179.86
Θ z 35.63

1.603E+01

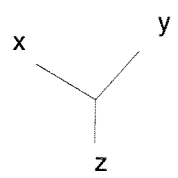
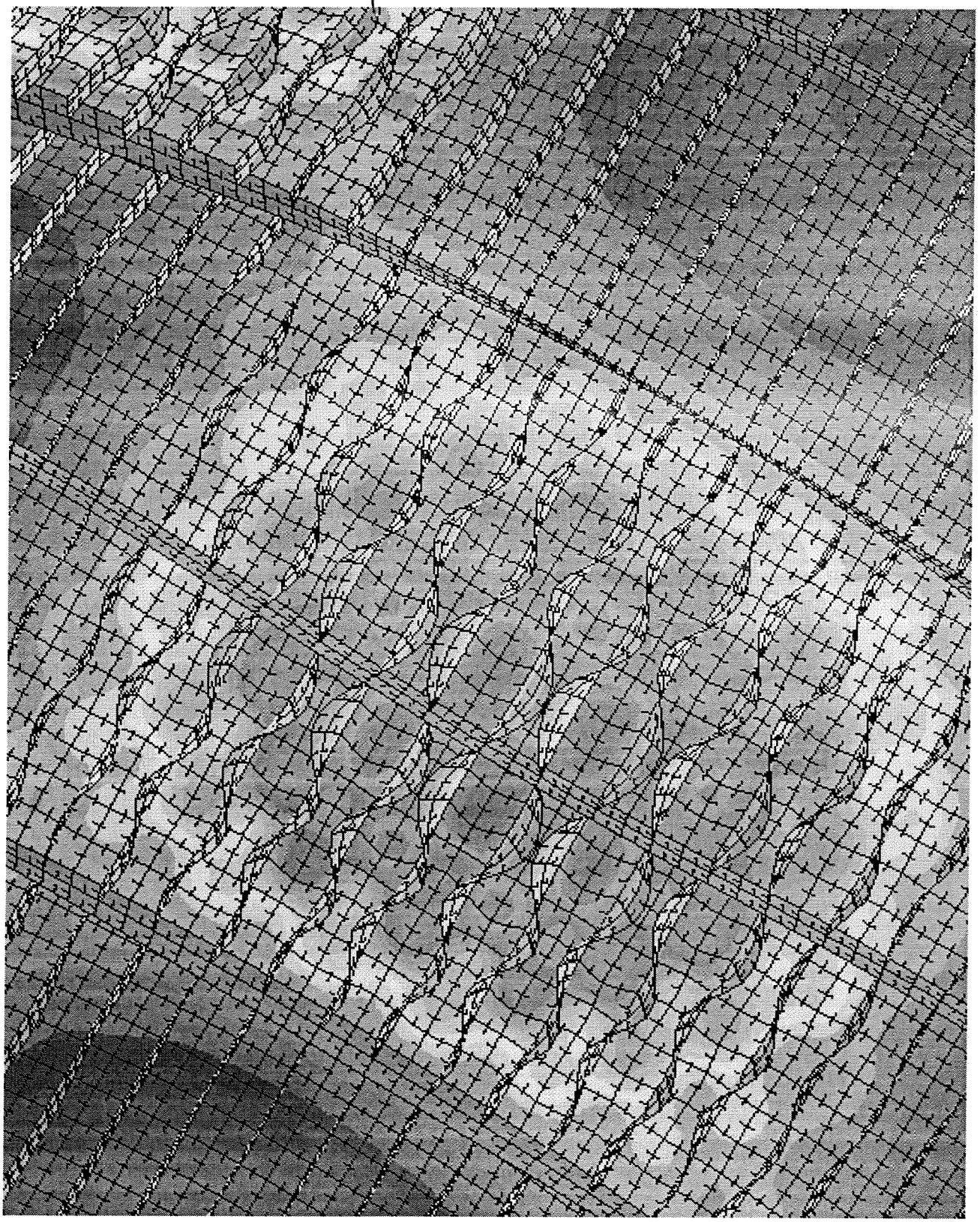


Fig. 56

Wimp = -0.125"



Enlarged view of previous figure

Fig. 57

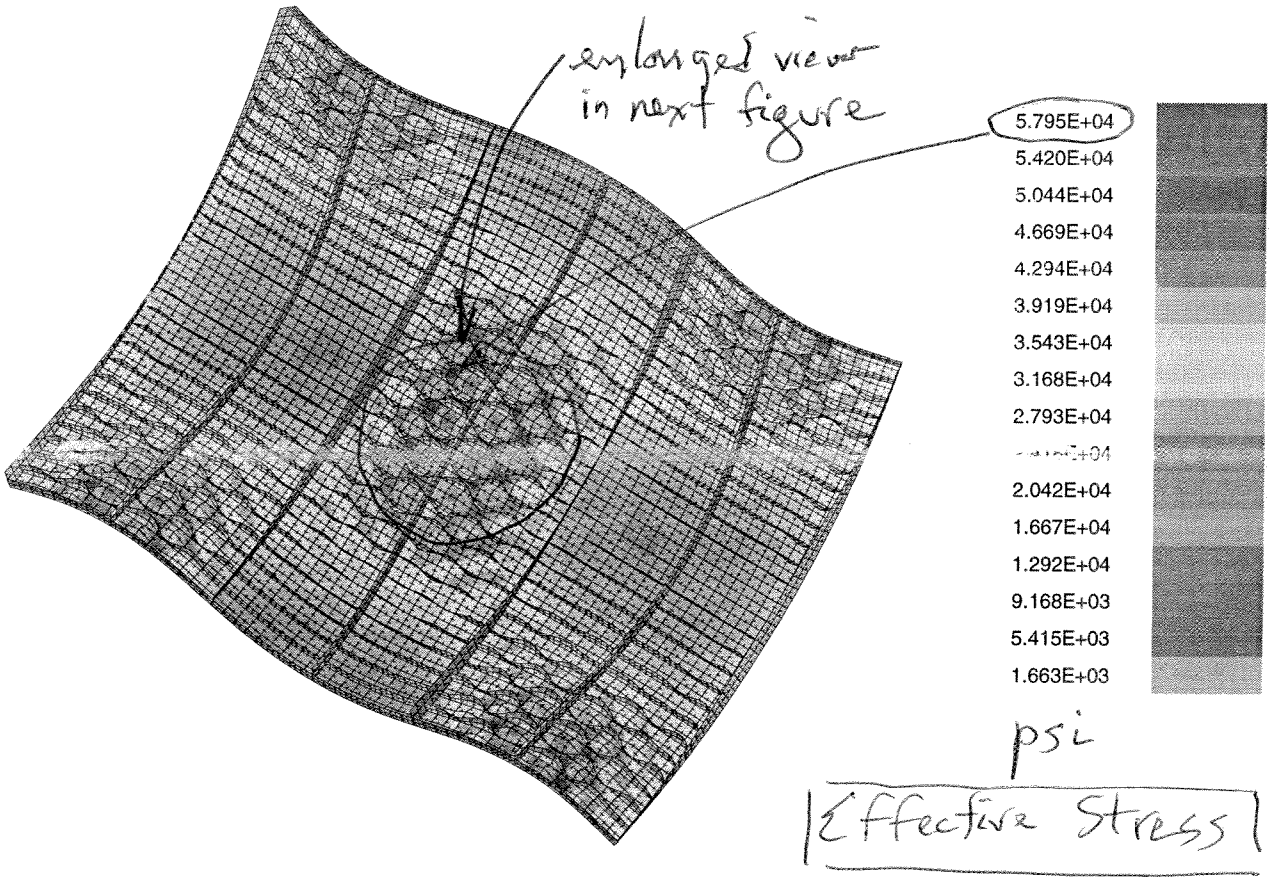
Table 57 input for STAPL: nasaorthb.pin

```
nonlinear effective stress - inner fiber same view a linear buckling mode
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  7  30  0 0 0 0 0 1 $PL-3  KPLOT,VIEW,ITEM,STEP,MODE,IFRNG,COLOR,ICOMP
   0.0   3  0.0  0.0  0.0 $PL-5  DSCALE,NROTS,LWSCALE,RNGMIN,RGMAX
  1   -35.84   $PL-6  IROT,ROT
  2   180.14   $PL-6  IROT,ROT
  3    35.63   $PL-6  IROT,ROT
```

inner fiber

effective stress

$W_{imp} = -0.125''$



solution scale = 0.1635E+02
PA= 1.27888E+00 PB= 0.00000E+00 PX= 0.00000E+00
step 30 fabrication system ,seff, layer 1, inner fiber
nonlinear effective stress - inner fiber same view a linear buckling mode
Minimum value = 1.66278E+03, Maximum value = 5.79483E+04

Θ x -35.84
Θ y -179.86
Θ z 35.63

1.603E+01

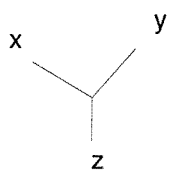
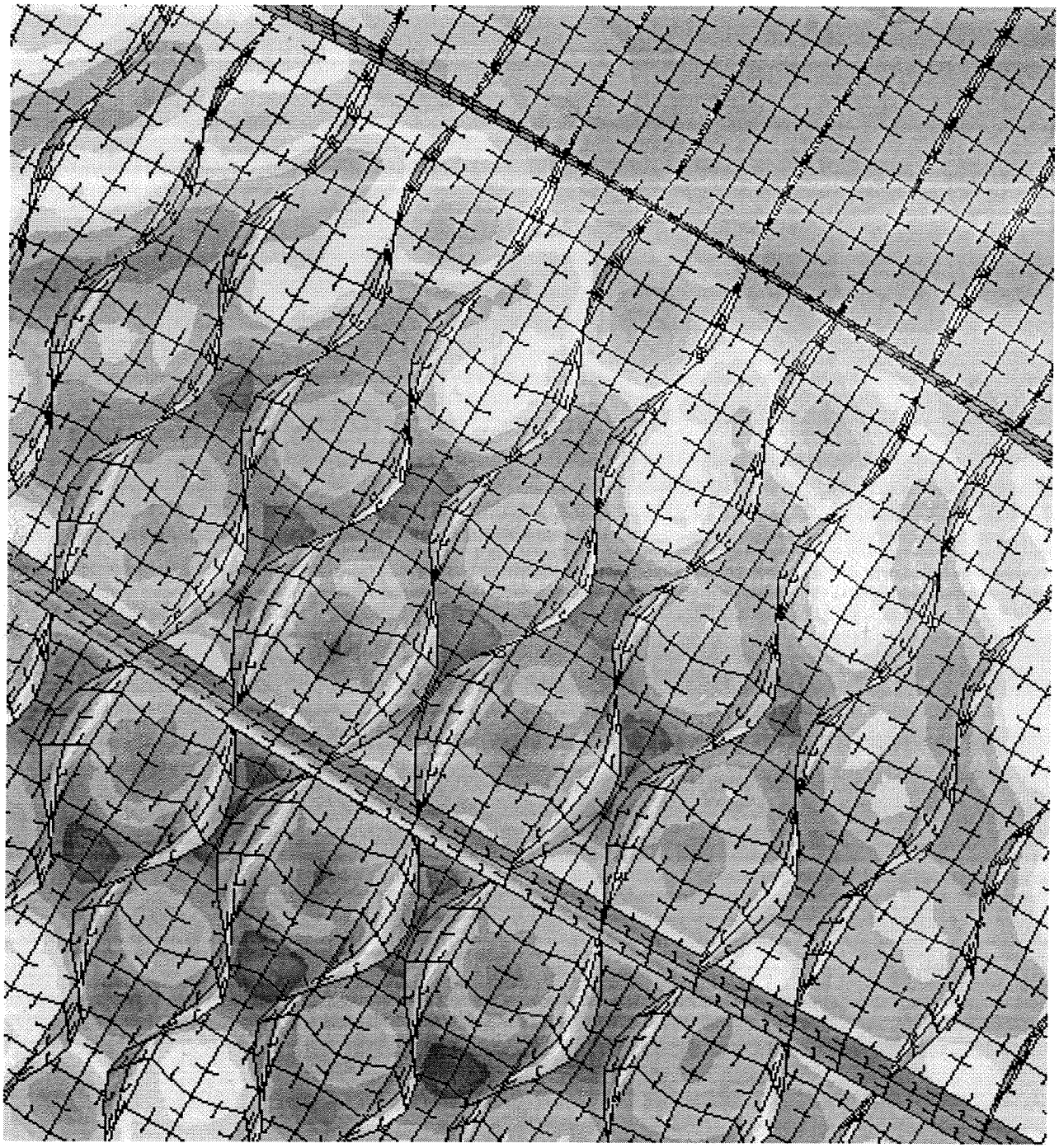


Fig. 58

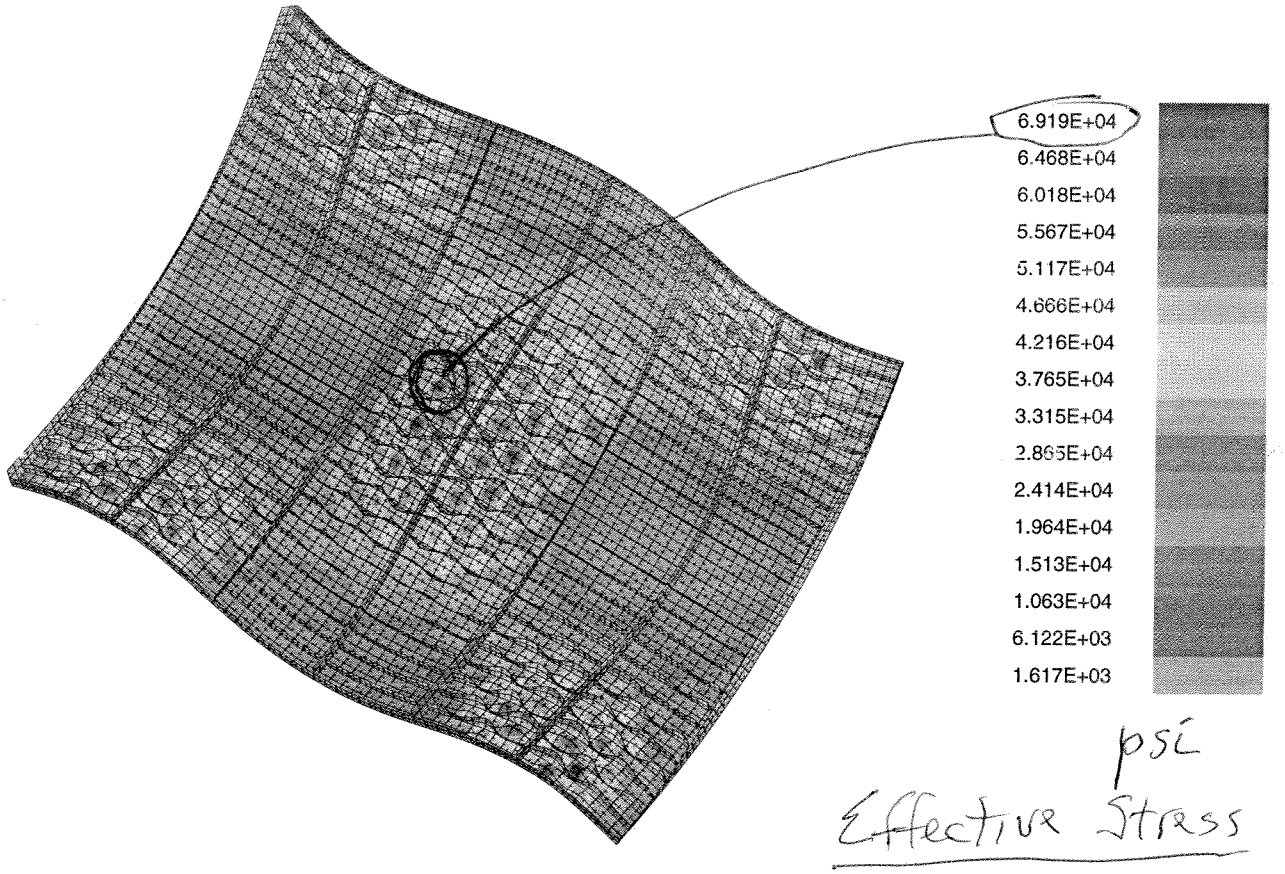
$W_{imp} = -0.125"$



Enlarged view of previous figure
Effective stress (inner fiber)

Fig. 59

Wimp = -0.125"



psi

Effective Stress

solution scale = 0.1635E+02

PA= 1.27888E+00 PB= 0.00000E+00 PX= 0.00000E+00

step 30 fabrication system ,seff, layer 1, outer fiber

nonlinear effective stress - ~~inner~~ outer fiber same view a linear buckling mode

Minimum value = 1.61686E+03, Maximum value = 6.91882E+04

Θ x -35.84
Θ y -179.86
Θ z 35.63

1.603E+01

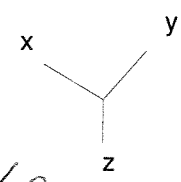


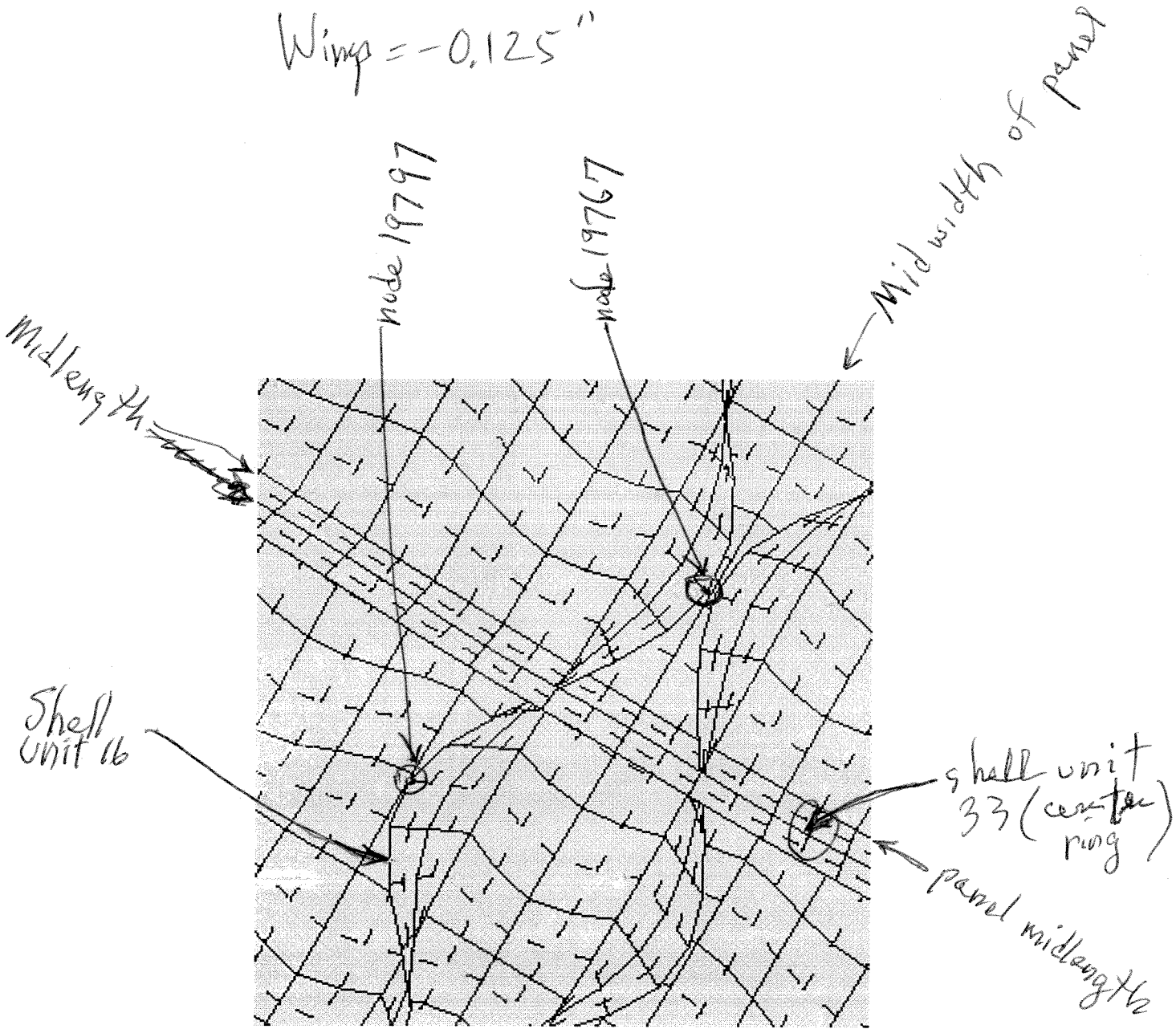
Fig. ~~59~~ 60

Table 58 nasaortho.pin (input for STAPL)

```
STAGS model: nonlinear deformation, same view as linear buckling modes
  1   0   1   0   $PL-2   NPLOT,IPREP,IPRS,KDEV
  1   4   1  30   0 0 0   3   $PL-3   KPLOT,VIEW,ITEM,STEP,MODE,IFRNG,COLOR,ICOMP
  1  15  16  33
  0.0    3   0.0   0.0   0.0 $PL-5   DSCALE,NROTS,LWSCALE,RNGMIN,RGMAX
  1    -35.84    $PL-6   IROT,ROT
  2    180.14    $PL-6   IROT,ROT
  3     35.63    $PL-6   IROT,ROT
```

Shell unit numbers

We do this because we want to get a plot of stringer tip sideways v.s. load factor, PA. We need to get the nodal point numbers for which we want to plot the displacement w (normal displacement) at the tip of the stringer.



This "zoomed in" plot, nasacortho.pdf, shows the sideway of two of the central stringers (shell units 15 & 16). We include shell unit 33 (center ring) in the plot as a "marker" so we know where we are along the panel length.

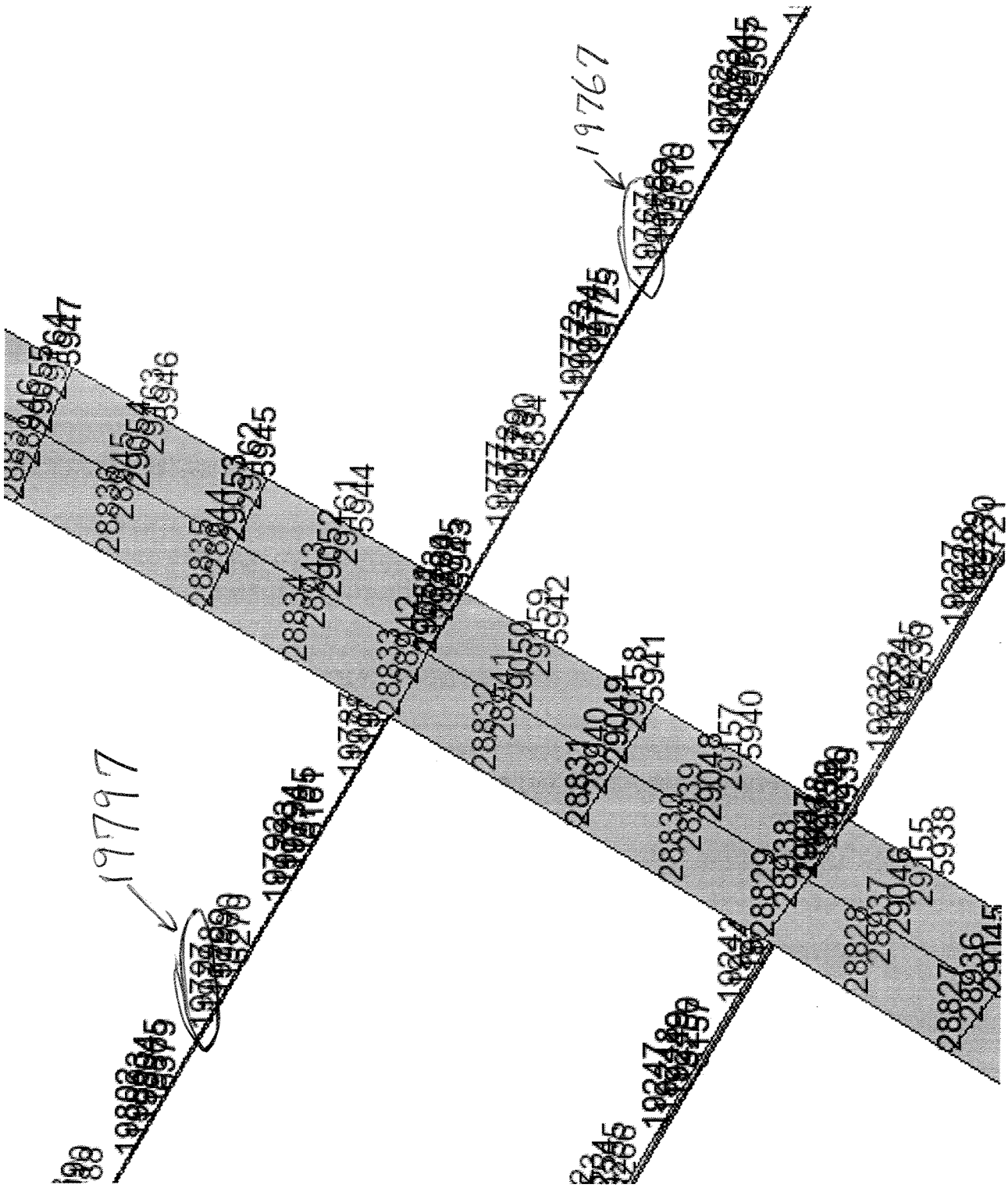
Fig. 61

Table 59 nasaortho.pin (input to STAPL)

```
nodal pts
  1   0   0   0   $PL-2   NPLOT,IPREP,IPRS,KDEV
      0       3       6   $PL-3   KPLOT,VIEW,ITEM
     15  16  33
  0.0     3   0.0   0.0   0.0 $PL-5   DSCALE,NROTS,LWSCALE,RNGMIN,RGMAX
  1    -35.84     $PL-6   IROT,ROT
  2    180.14     $PL-6   IROT,ROT
  3     35.63     $PL-6   IROT,ROT
```

shell unit numbers

This input to STAPL gives us a plot of nodal point numbers in shell units 15, 16, 33



nasaortho.pdf ("zoomed in")
gives nodal point numbers.

Fig. 62

Table 60 nasaortho.pxy (input for xytrans)

```
P               $ (P)lotps or (S)pread_Sheet output
nasaortho       $ STAGS solution 'Case Name'
F               $ (F)ull or (C)ondensed Model
Y               $ (Y)es-(N)o: setup data for another plot
 5              $ x-axis variable = choice (1 to 15)
  19767         $ node no. (0 = ask for Unit,Row,Col)
3               $ comp no., dis,vel,acc (1-6) = u,v,w,ru,rv,rw
S               $ (G)lobal or (S)hell ref surface
N               $ (Y)es-(N)o: specify x-variable scale factor
 2              $ y-axis variable = choice (1 to 15)
N               $ (Y)es-(N)o: specify y-variable scale factor
N               $ (Y)es-(N)o: specify subrange of loadsteps
Y               $ (Y)es-(N)o: plotted points start at origin
Y               $ (Y)es-(N)o: setup data for another plot
 5              $ x-axis variable = choice (1 to 15)
  19797         $ node no. (0 = ask for Unit,Row,Col)
3               $ comp no., dis,vel,acc (1-6) = u,v,w,ru,rv,rw
S               $ (G)lobal or (S)hell ref surface
N               $ (Y)es-(N)o: specify x-variable scale factor
 2              $ y-axis variable = choice (1 to 15)
N               $ (Y)es-(N)o: specify y-variable scale factor
N               $ (Y)es-(N)o: specify subrange of loadsteps
Y               $ (Y)es-(N)o: plotted points start at origin
N               $ (Y)es-(N)o: setup data for another plot
```

Input for the STAGS postprocessor called "xytrans", by means of which we can obtain plots of behavior vs load factor, PA.

Table 61 nasacrtko.plt

(output from xyfrans)

"Disp(19767,w,L) vs. load_PA

0.000000E+00	0.000000E+00
-5.209678E-05	5.000000E-02
-1.055498E-04	1.000000E-01
-1.463592E-04	1.373706E-01
-2.086140E-04	1.931998E-01
-3.359427E-04	3.039571E-01
-5.265992E-04	4.674022E-01
-7.317129E-04	7.045225E-01
2.775120E-03	1.000000E+00
6.441515E-03	1.027203E+00
1.352948E-02	1.060817E+00
1.728464E-02	1.080000E+00
1.762845E-02	1.081875E+00
1.813534E-02	1.084673E+00
1.912165E-02	1.090225E+00
2.099985E-02	1.101146E+00
2.426329E-02	1.120900E+00
2.572809E-02	1.130000E+00
2.587521E-02	1.130924E+00
2.609434E-02	1.132300E+00
2.653002E-02	1.135046E+00
2.739362E-02	1.140516E+00
2.906006E-02	1.151100E+00
3.131563E-02	1.165280E+00
3.417067E-02	1.182905E+00
3.692499E-02	1.199624E+00
4.020961E-02	1.219368E+00
4.409163E-02	1.242547E+00
4.830506E-02	1.267161E+00
4.957034E-02	1.274388E+00
5.036319E-02	1.278876E+00

"Disp(19797,w,L) vs. load_PA

0.000000E+00	0.000000E+00
-9.217502E-05	5.000000E-02
-1.890059E-04	1.000000E-01
-2.646756E-04	1.373706E-01
-3.834679E-04	1.931998E-01
-6.425915E-04	3.039571E-01
-1.099383E-03	4.674022E-01
-2.044931E-03	7.045225E-01
-7.529078E-03	1.000000E+00
-1.144196E-02	1.027203E+00
-1.885698E-02	1.060817E+00
-2.280614E-02	1.080000E+00
-2.316942E-02	1.081875E+00
-2.370552E-02	1.084673E+00
-2.475039E-02	1.090225E+00
-2.674599E-02	1.101146E+00
-3.023196E-02	1.120900E+00
-3.180299E-02	1.130000E+00
-3.196100E-02	1.130924E+00
-3.219638E-02	1.132300E+00
-3.266461E-02	1.135046E+00
-3.359368E-02	1.140516E+00
-3.538966E-02	1.151100E+00
-3.782733E-02	1.165280E+00
-4.092787E-02	1.182905E+00
-4.393934E-02	1.199624E+00
-4.756652E-02	1.219368E+00
-5.191186E-02	1.242547E+00
-5.669423E-02	1.267161E+00
-5.814189E-02	1.274388E+00
-5.905126E-02	1.278876E+00

Table 62 input for plotps.linux: nasaortho.input

```
# Global directives, stringer sidesway, stagsworthy model, wimp=0.125 inch
=title(nasaortho central stringer sidesway, Wimp=-0.125 inch)
=xlabel(Sidesway, w, of tip of central stringer near panel midlength)
=ylabel(Load factor, PA (PA = 1.0 = design load, Nx=-2219 lb/in))
# data set 1
+legend(Sidesway (inches) of stringer tip at nodal point 19767)
+setmarker( 0)
   0.000000E+00    0.000000E+00
  -5.209678E-05    5.000000E-02
  -1.055498E-04    1.000000E-01
  -1.463592E-04    1.373706E-01
  -2.086140E-04    1.931998E-01
  -3.359427E-04    3.039571E-01
  -5.265992E-04    4.674022E-01
  -7.317129E-04    7.045225E-01
   2.775120E-03    1.000000E+00
   6.441515E-03    1.027203E+00
   1.352948E-02    1.060817E+00
   1.728464E-02    1.080000E+00
   1.762845E-02    1.081875E+00
   1.813534E-02    1.084673E+00
   1.912165E-02    1.090225E+00
   2.099985E-02    1.101146E+00
   2.426329E-02    1.120900E+00
   2.572809E-02    1.130000E+00
   2.587521E-02    1.130924E+00
   2.609434E-02    1.132300E+00
   2.653002E-02    1.135046E+00
   2.739362E-02    1.140516E+00
   2.906006E-02    1.151100E+00
   3.131563E-02    1.165280E+00
   3.417067E-02    1.182905E+00
   3.692499E-02    1.199624E+00
   4.020961E-02    1.219368E+00
   4.409163E-02    1.242547E+00
   4.830506E-02    1.267161E+00
   4.957034E-02    1.274388E+00
   5.036319E-02    1.278876E+00
```

from previous table

```
# data set 2
+legend(Sidesway (inches) of stringer tip at nodal point 19797)
+setmarker( 1)
   0.000000E+00    0.000000E+00
  -9.217502E-05    5.000000E-02
  -1.890059E-04    1.000000E-01
  -2.646756E-04    1.373706E-01
  -3.834679E-04    1.931998E-01
  -6.425915E-04    3.039571E-01
  -1.099383E-03    4.674022E-01
  -2.044931E-03    7.045225E-01
  -7.529078E-03    1.000000E+00
  -1.144196E-02    1.027203E+00
  -1.885698E-02    1.060817E+00
  -2.280614E-02    1.080000E+00
  -2.316942E-02    1.081875E+00
  -2.370552E-02    1.084673E+00
  -2.475039E-02    1.090225E+00
  -2.674599E-02    1.101146E+00
  -3.023196E-02    1.120900E+00
  -3.180299E-02    1.130000E+00
  -3.196100E-02    1.130924E+00
  -3.219638E-02    1.132300E+00
  -3.266461E-02    1.135046E+00
  -3.359368E-02    1.140516E+00
  -3.538966E-02    1.151100E+00
  -3.782733E-02    1.165280E+00
  -4.092787E-02    1.182905E+00
  -4.393934E-02    1.199624E+00
  -4.756652E-02    1.219368E+00
  -5.191186E-02    1.242547E+00
  -5.669423E-02    1.267161E+00
  -5.814189E-02    1.274388E+00
  -5.905126E-02    1.278876E+00
```

from previous table

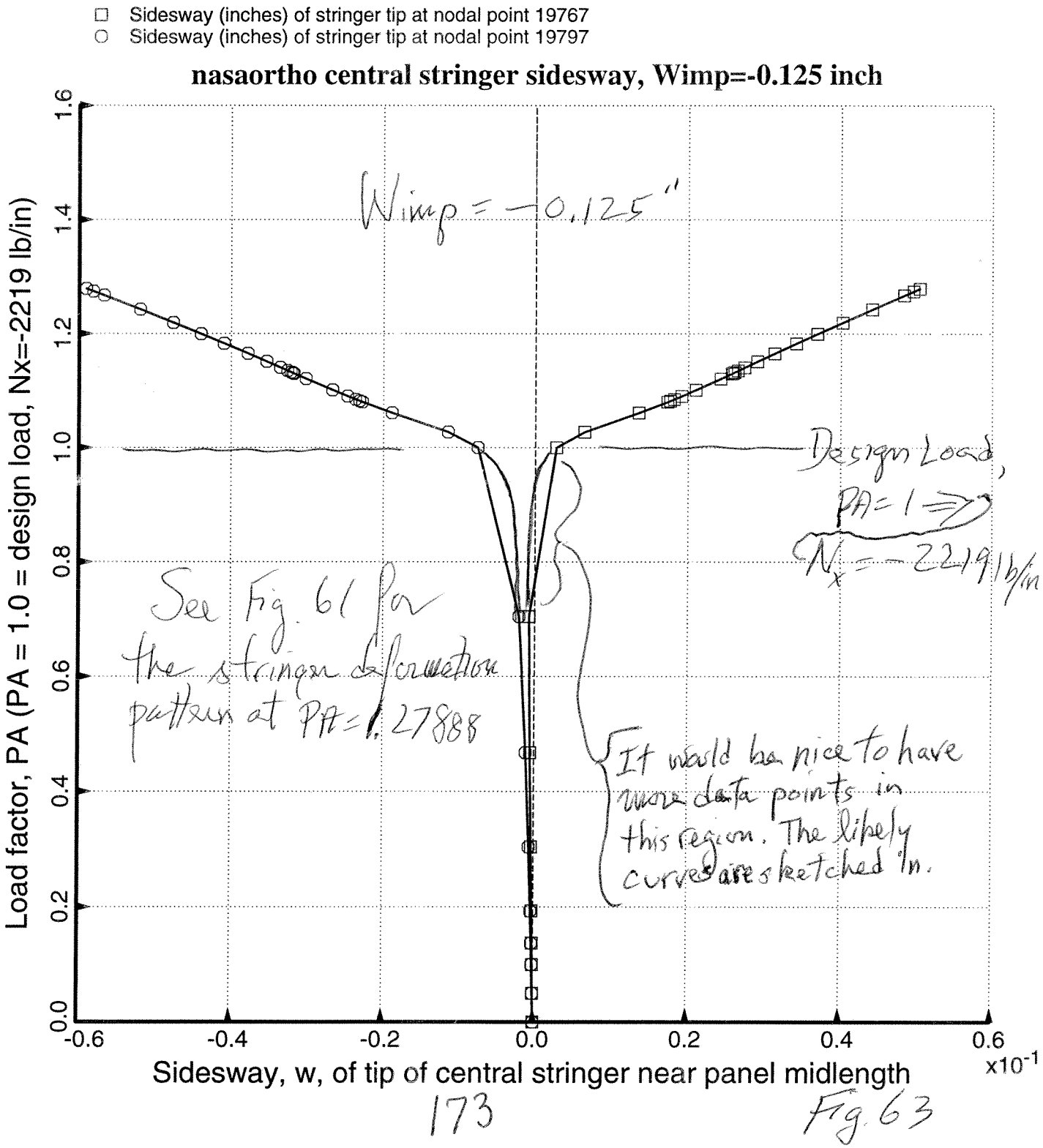

Sidesway (inches) of stringer tip at nodal point 19767
Sidesway (inches) of stringer tip at nodal point 19797
nasaortho central stringer sidesway, Wimp=-0.125 inch
Load factor, PA (PA = 1.0 = design load, Nx=-2219 lb/in)
Sidesway, w, of tip of central stringer near panel midlength
x10^-1
Wimp = -0.125"
Design Load, PA=1 ⇒ Nx = -2219 lb/in
See Fig. 61 for the stringer deformation pattern at PA=1.27888
It would be nice to have more data points in this region. The likely curve is sketched in.

Fig. 63

Table 63 nasarrtho. STG (input for STAGSUNIT)

```
       n        $ Do you want a tutorial session and tutorial output?
       1        $ Choose type of STAGS analysis (1,3,4,5,6),INDIC
       0        $ Restart from ISTARTth load step (0=1st nonlinear soln), ISTART
1.000000        $ Local buckling load factor from PANDA2, EIGLOC
       y        $ Are the dimensions in this case in inches?
       1        $ Nonlinear (0) or linear (1) kinematic relations?, ILIN
       0        $ Type 1 for closed (360-deg) cyl. shell, 0 otherwise, ITOTAL
68.75000        $ X-direction length of the STAGS model of the panel: XSTAGS
50.26548        $ Panel length in the plane of the screen, L2
       n        $ Is the nodal point spacing uniform along the stringer axis?
22.91667        $ Axial callout X(i) where the nodal point spacing changes, X( 1)
      37        $ Number of nodes n(i) from X(i-1) to X(i) (n=odd!), n( 1)
       y        $ Are there any more interior axial stations x where dx changes?
45.83333        $ Axial callout X(i) where the nodal point spacing changes, X( 2)
      73        $ Number of nodes n(i) from X(i-1) to X(i) (n=odd!), n( 2)
       n        $ Are there any more interior axial stations x where dx changes?
      37        $ Number of nodes n(i) from last X to x = XSTAGS, n( 3)
   -2219        $ Resultant (e.g. lb/in) normal to the plane of screen, Nx
       0        $ Resultant (e.g. lb/in) in the plane of the screen,    Ny
       0        $ In-plane shear in load set A,                         Nxy
       0        $ Normal pressure in STAGS model in Load Set A, p
       0        $ Resultant (e.g. lb/in) normal to the plane of screen, Nx0
       0        $ Resultant (e.g. lb/in) in the plane of the screen,    Ny0
       0        $ Normal pressure in STAGS model in Load Set B, p0
       1        $ Starting load factor for Load System A, STLD(1)
       0        $ Load factor increment for Load System A, STEP(1)
       1        $ Maximum load factor for Load System A, FACM(1)
       0        $ Starting load factor for Load System B, STLD(2)
       0        $ Load factor increment for Load System B, STEP(2)
       0        $ Maximum load factor for Load System B, FACM(2)
       8        $ How many eigenvalues do you want? NEIGS
     480        $ Choose element type (410 or 411 or 480) for panel skin
       n        $ Have you obtained buckling modes from STAGS for this case?
     162        $ Number of stringers in STAGS model of 360-deg. cylinder
       7        $ Number of rings in the STAGS model of the panel
       y        $ Are there rings at the ends of the panel?
       0        $ Number of finite elements between adjacent stringers
     100        $ Number of finite elements over circumference, NELCIR
       9        $ Number of finite elements between adjacent rings
       3        $ Stringer model: 1 or 2 or 3 or 4 or 5(Type H(elp))
       3        $ Ring model: 1 or 2 or 3 or 4 or 5 (Type H(elp))
      -1        $ Reference surface of cyl: 1=outer, 0=middle, -1=inner
       n        $ Do you want to use fasteners (they are like rigid links)?
       n        $ Are the stringers to be "smeared out"?
       n        $ Is the nodal point spacing uniform around the circumference?
24.44444        $ Circ. callout Y(i) where the nodal point spacing changes, Y( 1)
      45        $ Number of nodes n(i) from Y(i-1) to Y(i) (n=odd!), n( 1)
       y        $ Are there any more interior axial stations y where dy changes?
35.55555        $ Circ. callout Y(i) where the nodal point spacing changes. Y( 2)
      41        $ Number of nodes n(i) from Y(i-1) to Y(i) (n=odd!), n( 2)
       n        $ Are there any more interior axial stations y where dy changes?
      45        $ Number of nodes n(i) from last Y to y = YSTAGS, n( 3)
       n        $ Are the rings to be "smeared out"?
       5        $ Number of nodes over height of stiffener webs, NODWEB
       3        $ Number of nodes over width of stringer flange, NDFLGS
       3        $ Number of nodes over width of ring flange, NDFLGR
       y        $ Do you want stringer(s) with a high nodal point density?
      13        $ Number of a stringer to have high mesh density, NUMSTR
       y        $ Do you want to choose another stringer?
      14        $ Number of a stringer to have high mesh density, NUMSTR
       y        $ Do you want to choose another stringer?
      15        $ Number of a stringer to have high mesh density, NUMSTR
       y        $ Do you want to choose another stringer?
      16        $ Number of a stringer to have high mesh density, NUMSTR
       n        $ Do you want to choose another stringer?
       n        $ Do you want ring(s) with a high nodal point density?
       n        $ Is there plasticity in this STAGS model?
       y        $ Do you want to use the "least-squares" model for torque?
       y        $ Is stiffener sidesway permitted at the panel edges?
       y        $ Do you want symmetry conditions along the straight edges?
```

note → 1

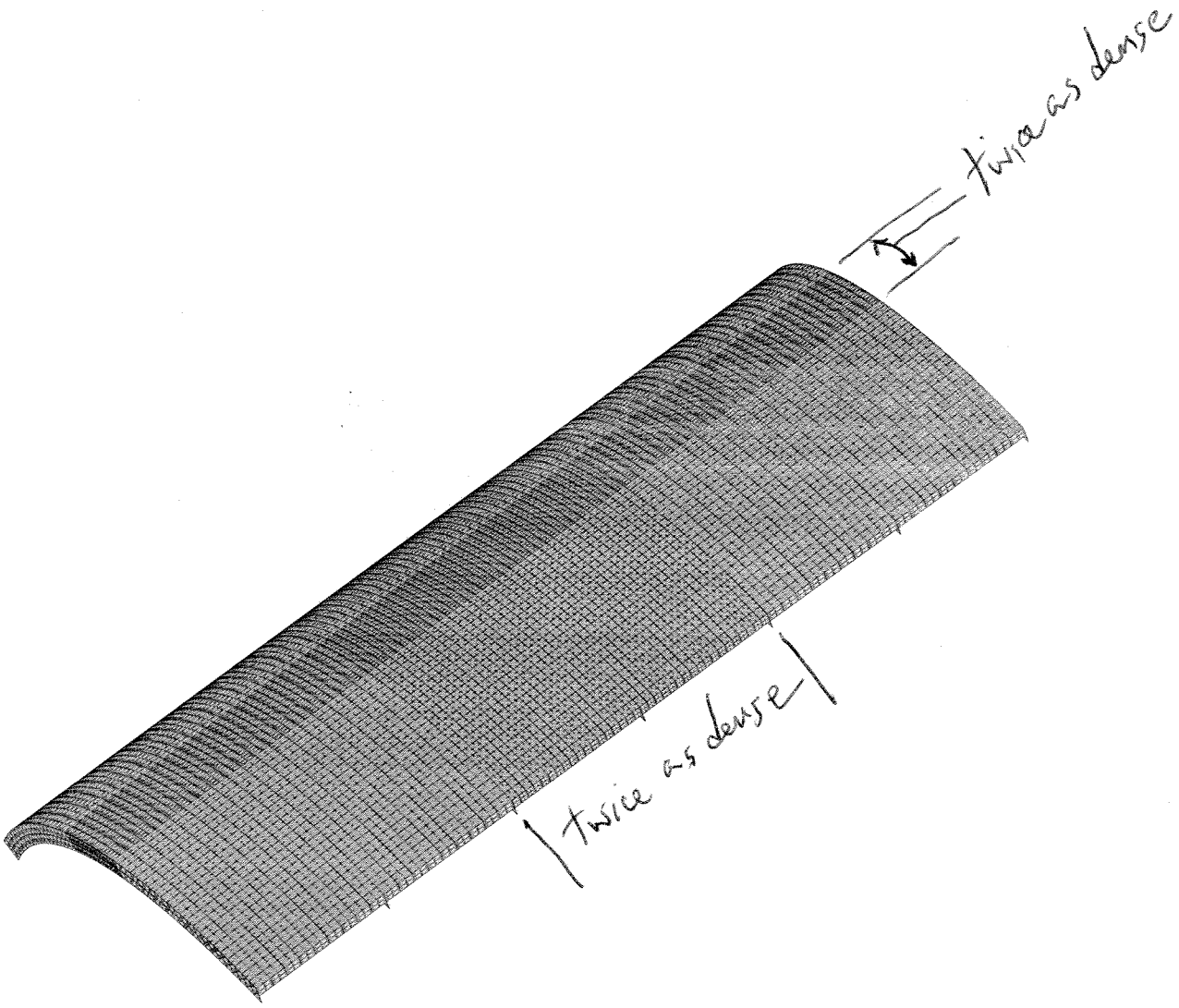
→ 0

note, use 0 to get nonuniform circumferential mesh. It will give you a message, but just ignore that message

Nonuniform mesh

Nonuniform mesh

STAGS panel with nonuniform mesh



Θ x -35.84
Θ y -13.14
Θ z 35.63

y z x

Model geometry, all units
nasaortho STAGS INPUT FOR STIFFENED CYL.(STAGSUNIT=SHELL UNITS)

1.216E+01

Fig. 64