Table 25 Run stream to obtain STAGS predictions for a case such as "allenflat", for which a transient (INDIC=6) STAGS run is required.

```
===========================================================================
 command       names of input/output files
---------      ---------------------------
stagsunit      allenflat.superopt1.5bay.yvariablespacing3.480.stg
               table19/allenflat.bin, allenflat.inp
```

************************ IMPORTANT NOTE ***************************

The applied load, Nx = -100.0 lb/in, which is one tenth of the design load, Nx = -1000.0 lb/in. Therefore, in the STAGS runs to follow, the load factor, PA = 10.0, corresponds to the design load, Nx = -1000 lb/in that was used in the PANDA2 runs.

In all the STAGS runs executed for the generation of this report the value of Nx specified in the *.stg files is always -100.0 lb/in, not Nx = -1000.0 lb/in.

****

(copy allenflat.bin and allenflat.inp to a directory where STAGS is run.)
(go to the directory where STAGS is to be run.)
(activate the STAGS commands: "source ...../stags5/prc/initialize")
(run a linear bifurcation buckling analysis (INDIC=1) of the curved panel)
(the allenflat.bin file is as follows:)

```
---------------------------------------------------------------------
 allenflat STAGS INPUT FOR STIFFENED CYL.(STAGSUNIT=SHELL UNITS)
 1, $ INDIC=1 is bifur.buckling; INDIC=3 is nonlinear BEGIN B-1
 1, $ IPOST=1 means save displacements every IPOSTth step
 0, $ ILIST =0 means normal batch-oriented output
 0, $ ICOR  =0 means projection in; 1 means not in.
 1, $ IMPTHE=index for imperfection theory.
 0, $ ICHIST=index for crack archive option
 0, $ IFLU  =0 means no fluid interaction.
 -1 $ ISOLVR= 0 means original solver; -1 new solver.END B-1 rec
 1.000E+00, $ STLD(1) = starting load factor, System A. BEGIN C-1 rec.
 0.000E+00, $ STEP(1) = load factor increment, System A
 1.000E+00, $ FACM(1) = maximum load factor, System A
 0.000E+00, $ STLD(2) = starting load factor, System B
 0.000E+00, $ STEP(2) = load factor increment, System B
 0.000E+00, $ FACM(2) = maximum load factor, System B
 0   $ ITEMP =0 means no thermal loads. END C-1 rec.
 10000, $ NSEC= number of CPU seconds before run termination
 0., $ DELEV is eigenvalue error tolerance (0=.00001)
 0   $ IPRINT=0 means print modes, iteration data, END D-2 rec.
  1, $ NEIGS= number of eigenvalues sought.  BEGIN D-3 rec.
 2.000, $ SHIFT=initial eigenvalue shift
 0.000E+00, $ EIGA =lower bound of eigenvalue range
--------------------------------------------------------------------
```

(execute STAGS - STAGS run no. 1 for this case):

```
 command                 names of input/output files
---------               ---------------------------
stags -b allenflat  allenflat.bin, allenflat.inp/allenflat.out2, etc.
```

(part of the STAGS output file, allenflat.out2, is as follows:)

```
-------------------------------------------------------------------
  CONVERGENCE HAS BEEN OBTAINED FOR EIGENVALUES  1 THROUGH   1
                     CRITICAL LOAD FACTOR COMBINATION
   NO.    EIGENVALUE   LOAD SYSTEM A  LOAD SYSTEM B    @DOF
     1   3.02720E+00   3.367878E+00   0.000000E+00   11050
-------------------------------------------------------------------
```

(run the STAGS processor, STAPL, to obtain plot of linear buckling mode)
(the input for STAPL, allenflat.pin, is as follows:)

```
-------------------------------------------------------------------
Fig.46 linear buckling of perfect shell from STAGS; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
     1     0     4     0     1  $PL-3  KPLOT,NUNIT,ITEM,STEP,MODE
    0.0   3  $PL-5  DSCALE,NROTS
  1   -35.84   $PL-6  IROT,ROT
  2   -13.14   $PL-6  IROT,ROT
  3    35.63   $PL-6  IROT,ROT
-------------------------------------------------------------------
```

(Execute STAPL:)

```
 command                 names of input/output files
---------               ---------------------------
stapl allenflat          allenflat.pin/allenflat.pdf
(view the linear buckling mode:)
acroread allenflat.pdf   allenflat.pdf/Fig.46
```

(next, run nonlinear equilibrium (INDIC=3) of the same curved panel with
 a linear buckling modal imperfection with amplitude, Wimp=0.001 inch.)
(the new allenflat.bin file is as follows:)

```
-------------------------------------------------------------------
optimized imperfect shell, nonlinear theory (INDIC=3)
 3, $ INDIC=1 is bifur.buckling; INDIC=3 is nonlinear BEGIN B-1
 1, $ IPOST=1 means save displacements every IPOSTth step
 0, $ ILIST =0 means normal batch-oriented output
 0, $ ICOR  =0 means projection in; 1 means not in.
 1, $ IMPTHE=index for imperfection theory.
 0, $ IOPTIM=0 means bandwith optimization will be performed
```

```
 0, $ IFLU  =0 means no fluid interaction.
 -1 $ ISOLVR= 0 means original solver; -1 new solver.END B-1 rec
 1.0, $ STLD(1) = starting load factor, System A. BEGIN C-1 rec.
 1.0, $ STEP(1) = load factor increment, System A
 10.0, $ FACM(1) = maximum load factor, System A
 0.000E+00, $ STLD(2) = starting load factor, System B
 0.000E+00, $ STEP(2) = load factor increment, System B
 0.000E+00, $ FACM(2) = maximum load factor, System B
 0  $ ITEMP =0 means no thermal loads. END C-1 rec.
   0, $ ISTART=restart from ISTARTth load step.   BEGIN D-1 rec.
 2000,$ NSEC= number of CPU seconds before run termination
  5,$ NCUT = number of times step size may be cut
  -20, $ NEWT = number of refactorings allowed
-1,$ NSTRAT=-1 means path length used as independent parameter
 0.0001,$ DELX=convergence tolerance
 0. $ WUND = 0 means initial relaxation factor =1.END D-1 rec.
 0,  6, 0  $ NPATH=0: Riks method, NEIGS=no.of eigs, NSOL=0: contin.  ET-1
--------------------------------------------------------------------------------
```

(The new allenflat.inp file is obtained by editing the old allenflat.inp file as follows:)

(1. change NIMPFS from 0 to 1:)

1, $ NIMPFS=number of bucklng modal imperfections.

(2. insert an additional record, as follows:)

C Begin B-4, B-5 input data, if any...

0.001 0 1 1 $B-5 WIMPFA, IMSTEP, IMMODE, IMRUN (1st imperf.)

(execute STAGS - STAGS run no. 2 for this case):

```
 command                  names of input/output files
---------                 ---------------------------
stags -b allenflat        allenflat.bin, allenflat.inp/allenflat.out2, etc.
```

(part of the STAGS output file, allenflat.out2, is as follows:)

```
--------------------------------------------------------------------------------
 CONVERGENCE HAS NOT BEEN OBTAINED.
 MAXIMUM NO. OF STEP CUTS =     5 REACHED.

FORMING STABILITY MATRIX
   DISP   KLIN   STEP   PA            PB
     22      1     14   0.71955E+01   0.000000E+00

(lines skipped to save space)

  CONVERGENCE HAS BEEN OBTAINED FOR EIGENVALUES  1 THROUGH   6
```

```
                         CRITICAL LOAD FACTOR COMBINATION
   NO.     EIGENVALUE    LOAD SYSTEM A  LOAD SYSTEM B    @DOF
     1   4.709238E-03   7.229472E+00   0.000000E+00   20005
     2   3.019511E-02   7.412858E+00   0.000000E+00    5725
     3   3.162666E-02   7.423159E+00   0.000000E+00   10673
     4   3.882389E-02   7.474947E+00   0.000000E+00    5881
     5   4.142593E-02   7.493670E+00   0.000000E+00   15509
     6   4.224388E-02   7.499556E+00   0.000000E+00   15869

(lines skipped to save space)

 LIST OF LOAD STEPS AND LOAD FACTORS
 STEP      PA             PB             PX
    0  0.100000E+01  0.000000E+00
    1  0.100000E+01  0.000000E+00
    2  0.200000E+01  0.000000E+00
    3  0.239567E+01  0.000000E+00
    4  0.264278E+01  0.000000E+00
    5  0.284529E+01  0.000000E+00
    6  0.305493E+01  0.000000E+00
    7  0.331657E+01  0.000000E+00
    8  0.368666E+01  0.000000E+00
    9  0.424756E+01  0.000000E+00
   10  0.511189E+01  0.000000E+00
   11  0.642003E+01  0.000000E+00
   12  0.687449E+01  0.000000E+00
   13  0.717470E+01  0.000000E+00
   14  0.719559E+01  0.000000E+00
```

(run the STAGS processor, STAPL, to obtain plot of nonlinear
equilibrium state of the panel at STEP No. 14)
(the input for STAPL, allenflat.pin, is as follows:)

```
Fig.47 nonlinear w same view as linear buckling mode; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  1  14  0 0 0  3  $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  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
  3   0.35630001E+02   $PL-6  IROT,ROT
```

(Execute STAPL:)

```
 command                   names of input/output files
```

```
---------                ---------------------------
stapl allenflat          allenflat.pin/allenflat.pdf
```
(view the nonlinear equilibrium state at STEP No. 14:)
acroread allenflat.pdf allenflat.pdf/Fig.47

(The highest load factor reached in the 2nd STAGS run was PA = 7.1955. The design load, Nx = -1000 lb/in, corresponds to PA = 10.0. In order to obtain STAGS predictions for higher values of PA than 7.1955, we have a choice:
1. We can introduce more imperfection shapes and launch another nonlinear static run, again starting from zero load, or
2. We can try a nonlinear transient run.

We decide to try a nonlinear transient run (INDIC=6).)

The new allenflat.bin file is as follows:

```
 STAGS INPUT for transient run (INDIC=6)
 6, $ INDIC=1 is bifur.buckling; INDIC=3 is nonlinear BEGIN B-1
 10, $ IPOST=10 means save displacements every 10th step
 0, $ ILIST =0 means normal batch-oriented output
 0, $ ICOR  =0 means projection in; 1 means not in.
 0, $ IMPTHE=index for imperfection theory.
 0, $ IOPTIM=0 means bandwith optimization will be performed
 0  $ IFLU  =0 means no fluid interaction.    END B-1 rec
 -1 $ ISOLVR= 0 means original solver; -1 new solver.END B-1 rec
 7.1955, $ STLD(1) = starting load factor, System A. BEGIN C-1 rec.
 0.000E+00, $ STEP(1) = load factor increment, System A
 7.1955, $ FACM(1) = maximum load factor, System A
 0.000E+00, $ STLD(2) = starting load factor, System B
 0.000E+00, $ STEP(2) = load factor increment, System B
 0.000E+00, $ FACM(2) = maximum load factor, System B
 0  $ ITEMP =0 means no thermal loads. END C-1 rec.
 14, $ ISTART=restart from ISTARTth load step.   BEGIN D-1 rec.
 50000,$ NSEC= number of CPU seconds before run termination
 60,$ NCUT = number of times step size may be cut
  -1, $ NEWT = number of refactorings allowed
-1,$ NSTRAT=-1 means path length used as independent parameter
 0.0002,$ DELX=convergence tolerance
 0. $ WUND = 0 means initial relaxation factor =1.END D-1 rec.
 0.,$ TMIN = 0. means starting time is zero.    BEGIN E-1 rec.
 0.400, $ TMAX = final time for transient analysis.
 1.000E-04, $ DT   = time increment for transient analysis.
 0., $ SUP = maximum expected displacement (irrelevant)
 1.500E-01, $ ALPHA=damping factor for mass matrix=DAMPNG*2*PI*CPS
```

```
 3.000E-04, $ BETA =damping factor for stiffness matrix=DAMPNG/2*PI*CPS
 0.000E+00, $ GAMMA=damping factor for velocity-dependent forces
 0.000E+00  $ THOLD can be used to suppress time step changes. END E-1
 0, $ IMPL = 0 means implicit time integration. BEGIN E-2 rec.
 4, $ METHOD=4 means use Parks formula for time integration
 1, $ IERRF =1 means use variable (automatic) time step
  0, $ IVELO =0 means number of modal initial velocities
 0, $ IFORCE=0 means no user-written FORCET
 1, $ IPA  = 1 means linear variation (constant) applied load
 0  $ IPB  = 0 means load system B is not included.  END E-2
 7.555, $ CA1 = transient load parameter(case (a), p3-21) BEGIN E-3
 0.000E+00, $ CA2 = transient load parameter(case (a), p3-21)
 0.000E+00, $ CA3 = transient load parameter(case (a), p3-21)
 1.000E+03, $ CA4 = transient load parameter(case (a), p3-21)
 1.000E+03, $ CA5 = transient load parameter(case (a), p3-21)
 0.000E+00  $ CA6 = transient load parameter(case (a), p3-21)   END E-3
```

********************* IMPORTANT NOTE ****************************

Note that:

7.555, $ CA1 = transient load parameter(case (a), p3-21) BEGIN E-3

In this case CA1 is set equal to about 1.05 x 7.1955. In transient runs intended to bypass a difficult point on the nonlinear static equilibrium path, in the first transient run of a possible series of transient runs, CA1 is usually set equal to a value from 1.02 to 1.05 times the specified load level, STLD(1) and FACM(1). Also, note the value set for stiffness matrix damping in this case:

3.000E-04, $ BETA =damping factor for stiffness matrix=DAMPNG/2*PI*CPS

****

(The allenflat.inp file remains as before for the remainder of this case.)

(execute STAGS - STAGS run no. 3 for this case):

```
 command                  names of input/output files
---------                 ---------------------------
stags -b allenflat        allenflat.bin, allenflat.inp/allenflat.out2, etc.
```

(part of the STAGS output file, allenflat.out2, is as follows:)

```
 step  450,  time=  4.00200E-01,  dt=  3.20000E-03
  iter     err       pred_err.    dof   max_resid.    dof    max_displ.   strain enrg.  kinetic enrg.
    1   5.7050E-06   2.3571E-04 22725  -9.6372E-04  18613    3.4100E-05    1.0060E+02    1.6474E-04

 displacement, load step 450, Pa=    7.55500E+00, Pb=    0.00000E+00, time=    4.00200E-01
 saved on file:  allenflat.rst
```

(Step 450 is the last step saved. In the STAGS transient runs results from every 10th step are saved.)

(We wish to obtain a plot of kinetic energy vs time. In the directory where we just executed STAGS, we type the following:)

```
awk -f ke.awk allenflat.out2 > allenflat.plt
```

(The allenflat.plt file contains the following:

1. strain energy vs time
2. kinetic energy vs time
3. total energy vs time

In this particular case the kinetic energy is very, very small compared to the strain energy. Therefore, we edit the allenflat.plt file to remove the strain energy and the total energy. We add an appropriate plot title and labels for the x and y axes, change the name of the file to "allenflat.kineticenergy.input", and execute the plotting utility, plotps.linux. (plotps.linux is a plotting utility created in the mid 1990s by the writer's son, Bill Bushnell.) The appropriate "plotps.linux" command at the writer's facility is:)

```
/home/progs/bin/plotps.linux < allenflat.kineticenergy.input > allenflat.kineticenergy.ps
```

(The resulting Postscript plot, allenflat.kineticenergy.ps, is displayed in Fig. 48. The input file for /home/progs/bin/plotps.linux, that is, the file called allenflat.kineticenergy.input, has the following lines at its beginning:)

```
----------------------------------------------------------------------
# Global directives, kinetic energy; STAGS INDIC=6; from "awk -f ke.awk allenflat.plt > allenflat.plt"
=title(Fig.48 STAGS time vs kinetic energy for case = allenflat; PA = 7.555)
=xlabel(Time (seconds); case = allenflat; 5-stringer-bay flat panel)
=ylabel(Kinetic energy (in-lb); awk -f ke.awk allenflat.out2 > allenflat.plt)
# data set 1
+legend(Kinetic energy (in-lb) from STAGS; 5-stringer-bay flat panel; transient (INDIC=6) run)
+markeroff
    0.0001     0.0049395
    0.0002      0.013963
    0.0003      0.024774
    0.0004      0.036222
    0.0006      0.057231
    0.0008      0.070461
```

etc.

(To see the plot of kinetic energy vs time on the computer screen, type:
gv allenflat.kineticenergy.ps
The PANDA2/STAGS user can generate the introductory lines for
other *.input files by analogy.)

(run the STAGS processor, STAPL, to obtain plot of nonlinear
equilibrium state of the panel at STEP No. 110)
(the input for STAPL, allenflat.pin, is as follows:)

```
Fig.49 nonlinear w same view as linear buckling mode; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  1  110  0 0 0  3  $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  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
  3   0.35630001E+02   $PL-6  IROT,ROT
```

(Execute STAPL:)

```
 command                   names of input/output files
---------                  ---------------------------
stapl allenflat            allenflat.pin/allenflat.pdf
```

(view the nonlinear equilibrium state at STEP No. 110:)
acroread allenflat.pdf allenflat.pdf/Fig.49

(Compare Fig.49 with Fig.47. The deformation pattern
remains unchanged.)

(run the STAGS processor, STAPL, to obtain plot of nonlinear
equilibrium state of the panel at STEP No. 160)
(the input for STAPL, allenflat.pin, is as follows:)

```
Fig.50 nonlinear w same view as linear buckling mode; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  1  160  0 0 0  3  $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  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
```

```
  3   0.35630001E+02   $PL-6  IROT,ROT
```

(Execute STAPL:)

```
 command                    names of input/output files
---------                   ---------------------------
stapl allenflat             allenflat.pin/allenflat.pdf
```
(view the nonlinear equilibrium state at STEP No. 160:)
acroread allenflat.pdf allenflat.pdf/Fig.50

(Compare Fig.50 with Fig.49. Note that there has appeared an additional wave in the 3rd stringer bay numbering from the bottom right of Fig. 50.)

(run the STAGS processor, STAPL, to obtain plot of nonlinear equilibrium state of the panel at STEP No. 450)
(the input for STAPL, allenflat.pin, is as follows:)

```
Fig.51 nonlinear w same view as linear buckling mode; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  1  450  0 0 0  3  $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  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
  3   0.35630001E+02   $PL-6  IROT,ROT
```

(Execute STAPL:)

```
 command                    names of input/output files
---------                   ---------------------------
stapl allenflat             allenflat.pin/allenflat.pdf
```
(view the nonlinear equilibrium state at STEP No. 450:)
acroread allenflat.pdf allenflat.pdf/Fig.51

(Compare Fig.51 with Fig.50. Note that there has appeared an additional wave in the 3rd stringer bay numbering from the bottom right of Fig. 51.)

(Next, we want to do "load relaxation" followed by a continuation of the static nonlinear run (INDIC=3) to a maximum load factor, PA = 10.0, which corresponds to the design load for which the optimum design was obtained by PANDA2, that is, to axial load, Nx = -1000.0 lb/in.)

The new allenflat.bin file is as follows:

```
 LOAD RELAXATION STAGS INPUT
 3, $ INDIC=1 is bifur.buckling; INDIC=3 is nonlinear BEGIN B-1
 1, $ IPOST=1 means save displacements every IPOSTth step
 0, $ ILIST =0 means normal batch-oriented output
 0, $ ICOR  =0 means projection in; 1 means not in.
 0, $ IMPTHE=index for imperfection theory.
 0, $ IOPTIM=0 means bandwith optimization will be performed
 0,  $ IFLU  =0 means no fluid interaction.    END B-1 rec
 -1 $ ISOLVR= 0 means original solver; -1 new solver.END B-1 rec
 7.555, $ STLD(1) = starting load factor, System A. BEGIN C-1 rec.
 0.100, $ STEP(1) = load factor increment, System A
 10.00E+00, $ FACM(1) = maximum load factor, System A
 0.000E+00, $ STLD(2) = starting load factor, System B
 0.000E+00, $ STEP(2) = load factor increment, System B
 0.000E+00, $ FACM(2) = maximum load factor, System B
 0  $ ITEMP =0 means no thermal loads. END C-1 rec.
 450, $ ISTART=restart from ISTARTth load step.   BEGIN D-1 rec.
 2000,$ NSEC= number of CPU seconds before run termination
  5,$ NCUT = number of times step size may be cut
  -20, $ NEWT = number of refactorings allowed
 0,$ NSTRAT=-1 means path length used as independent parameter
 0.0002,$ DELX=convergence tolerance
 0. $ WUND = 0 means initial relaxation factor =1.END D-1 rec.
 5,  0, 0  $ NPATH=0: Riks method, NEIGS=no.of eigs, NSOL=0: contin.  ET-1
```

(The allenflat.inp file remains as before for the remainder of this case.)

(execute STAGS - STAGS run no. 4 for this case):

```
 command                   names of input/output files
---------                  ---------------------------
stags -b allenflat         allenflat.bin, allenflat.inp/allenflat.out2, etc.
```

(part of the STAGS output file, allenflat.out2, is as follows:)

```
 LIST OF LOAD STEPS AND LOAD FACTORS
 STEP      PA             PB             PX
  450  0.755500E+01  0.000000E+00
  451  0.755500E+01  0.000000E+00  0.800000E+00
  452  0.755500E+01  0.000000E+00  0.120187E+00
  453  0.755500E+01  0.000000E+00  0.000000E+00
  454  0.764000E+01  0.000000E+00  0.000000E+00
```

```
  455  0.784601E+01  0.000000E+00  0.000000E+00
  456  0.820484E+01  0.000000E+00  0.000000E+00
  457  0.882142E+01  0.000000E+00  0.000000E+00
  458  0.969165E+01  0.000000E+00  0.000000E+00
  459  0.100000E+02  0.000000E+00  0.000000E+00
```

(run the STAGS processor, STAPL, to obtain plot of nonlinear
 equilibrium state of the panel at STEP No. 459)
(the input for STAPL, allenflat.pin, is as follows:)

```
Fig.52 nonlinear w same view as linear buckling mode; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  1  459  0 0 0  3  $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  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
  3   0.35630001E+02   $PL-6  IROT,ROT
```

(Execute STAPL:)

```
 command                 names of input/output files
---------                ---------------------------
stapl allenflat          allenflat.pin/allenflat.pdf
```
(view the nonlinear equilibrium state at STEP No. 459:)
acroread allenflat.pdf allenflat.pdf/Fig.52

(Compare Fig.52 with Fig.51. The deformation pattern has
not changed, but the amplitudes of the local buckles are
greater because the applied load is higher.)

(Next, obtain an "end-view" plot of the deformation in Fig. 52.
The input for STAPL, allenflat.pin, is as follows:)

```
Fig.53 nonlinear deformation, end view; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   7  1  459  0 0 0  3  $PL-3
KPLOT,VIEW,ITEM,STEP,MODE,IFRNG,COLOR,ICOMP
   1  2  3  4  5  6  7  $ shell units to include in plot. Rings are left
out.
  0.0   3  0.0  0.0  0.0 $PL-5  DSCALE,NROTS,LWSCALE,RNGMIN,RGMAX
  1   0.0   $PL-6  IROT,ROT
```

```
  2  90.0   $PL-6  IROT,ROT
  3   0.0   $PL-6  IROT,ROT
```

(Execute STAPL:)

```
 command                  names of input/output files
---------                 ---------------------------
stapl allenflat           allenflat.pin/allenflat.pdf
```
(end view of the nonlinear equilibrium state at STEP No. 459:)
acroread allenflat.pdf allenflat.pdf/Fig.53

(Next, obtain a plot of the outer fiber effective stress distribution
at the design load. The input for STAPL, allenflat.pin, is as follows:)

```
------------------------------------------------------------------
Fig.54 nonlinear effective stress - outer fiber; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   0  7 459  0 0 0 0 0 2 $PL-3  KPLOT,VIEW,ITEM,STEP,MODE,IFRNG,COLOR,ICOMP,LAYR,FIBR
   0.0   3  0.0  0.0  0.0 $PL-5  DSCALE,NROTS,LWSCALE,RNGMIN,RGMAX
  1  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
  3   0.35630001E+02   $PL-6  IROT,ROT
---------------------------------------------------------------------
```

(Execute STAPL:)

```
 command                  names of input/output files
---------                 ---------------------------
stapl allenflat           allenflat.pin/allenflat.pdf
```
(distribution of outer fiber effective stress at STEP No. 459:)
acroread allenflat.pdf allenflat.pdf/Fig.54

The input data for STAPL (allenflat.pin file) for inner fiber
effective stress in the panel skin only is as follows:

```
---------------------------------------------------------
Fig.56 nonlinear effective stress - inner fiber, skin only; case=allenflat
  1  0  1  0  $PL-2  NPLOT,IPREP,IPRS,KDEV
  2   1  7 459  0 0 0 0 0 0 $PL-3  KPLOT,VIEW,ITEM,STEP,MODE,IFRNG,COLOR,ICOMP,LAYR,FIBR
     1                      $  shell unit to be included in the plot
   0.0   3  0.0  0.0  0.0 $PL-5  DSCALE,NROTS,LWSCALE,RNGMIN,RGMAX
  1  -0.35840000E+02   $PL-6  IROT,ROT
  2  -0.13140000E+02   $PL-6  IROT,ROT
  3   0.35630001E+02   $PL-6  IROT,ROT
---------------------------------------------------------
```

(Execute STAPL:)

```
 command                   names of input/output files
---------                  ---------------------------
stapl allenflat            allenflat.pin/allenflat.pdf
```
(distribution of inner fiber effective stress, skin only, at STEP No. 459:)
acroread allenflat.pdf allenflat.pdf/Fig.56

(Next, we wish to obtain plots of the amplitude of typical inward and outward post-local buckles in the skin of the flat panel vs load factor, PA. We run the STAGS processor, xytrans, with the following input data (allenflat.pxy file):

```
---------------------------------------------------------
P                    $ (P)lotps or (S)pread_Sheet output
allenflat            $ 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)
   1365              $ 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)
   2146              $ 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)
   2172              $ 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)
   1604             $ 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
```

(The output from xytrans is the file, allenflat.plt. With some editing for an appropriate title, x-y axes labels, and legends, and after copying the edited allenflat.plt file into a file called "allenflat.w.input", and after typing the following command:
/home/progs/bin/plotps.linux < allenflat.w.input > allenflat.w.ps
we obtain the four STAGS traces in Fig. 63. The discontinuities between PA = 7.1955 and PA = 7.555
occur because of the transient (INDIC=6) STAGS run. The four horizontal arrays of data points at PA = 7.555 represent the STAGS results for every 10th time step obtained during the transient STAGS run. The beginning of the input file for /home/progs/bin/plotps.linux, that is, the file called allenflat.w.input, has the following lines:)

```
# Global directives, load normal deflection curves from STAGS
=title(Fig.63 Normal displacement w at postbuckled peaks)
=xlabel(5-stringer-bay, flat panel: normal displacement w (inches))
=ylabel(Axial load factor, PA; PANDA2 and STAGS; case=allenflat)
# data set 1
+legend(case=allenflat: STAGS prediction: second bay, flat panel; Node 1365; outward buckle)
+setmarker( 0)
  0.000000E+00   0.000000E+00
  4.028939E-04   1.000000E+00
  1.570225E-03   2.000000E+00
  2.924928E-03   2.395688E+00
  4.635954E-03   2.642795E+00
  6.841069E-03   2.845294E+00
  9.634167E-03   3.054905E+00
  1.308508E-02   3.316513E+00

 etc.
```

(The PANDA2/STAGS user can generate introductory lines for other

*.input files by analogy.)
==