Table 76 Output from **SUBROUTINE STRUCT** in GENOPT for
local buckling and effective stress in the shell skin
for the optimized **"perfect" unstiffened** equivalent ellipsoidal
shell with an **axisymmetric +mode 1** buckling modal imperfection
with very, very small amplitude, Wimp = +0.0001 inch. These
are predictions from BIGBOSOR4. Critical and near-critical
stresses are in bold face. **Locations of shell segments are**
indicated in Fig. 2. These are BIGBOSOR4 predictions.

```
 ============ Analysis No. 2 for Load Set No. 1 ============
 *** Start nonlinear axisymmetric stress,+(mode 1) imperfection  IMODX=0
 BIGBOSOR4 input file for nonlinear stress,+(mode 1) imperfect=
eqellperf.ALL2P

 Local skin and smeared stiffener buckling and stress, Seg.   1
 Skin buckling load factor,                      BUCMIN=6.7012E+00 at pt.13
 Smeared stringer/isogrid buckling load factor,BUCMNS=4.8992E+04 at pt. 1
 Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
 Smeared stringer/isogrid maximum eff. stress, STFMXS=2.6019E+04 at pt. 1
 Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
 Shell skin maximum effective stress,            SKNMAX=3.4692E+04 at pt. 1

 Local skin and smeared stiffener buckling and stress, Seg.   2
 Skin buckling load factor,                      BUCMIN=6.6653E+00 at pt. 1
 Smeared stringer/isogrid buckling load factor,BUCMNS=3.3041E+04 at pt.12
 Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
 Smeared stringer/isogrid maximum eff. stress, STFMXS=3.8580E+04 at pt.12
 Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
 Shell skin maximum effective stress,            SKNMAX=4.8294E+04 at pt.12

 Local skin and smeared stiffener buckling and stress, Seg.   3
 Skin buckling load factor,                      BUCMIN=2.1443E+00 at pt.13
 Smeared stringer/isogrid buckling load factor,BUCMNS=3.3497E+04 at pt. 1
 Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
 Smeared stringer/isogrid maximum eff. stress, STFMXS=3.8055E+04 at pt. 1
 Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
 Shell skin maximum effective stress,            SKNMAX=9.5868E+04 at pt.13

 Local skin and smeared stiffener buckling and stress, Seg.   4
 Skin buckling load factor,                      BUCMIN=2.1434E+00 at pt. 1
 Smeared stringer/isogrid buckling load factor,BUCMNS=2.1673E+04 at pt.13
 Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
 Smeared stringer/isogrid maximum eff. stress, STFMXS=5.8817E+04 at pt.13
 Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
 Shell skin maximum effective stress,            SKNMAX=9.5914E+04 at pt. 1
```

```
Local skin and smeared stiffener buckling and stress, Seg.   5
Skin buckling load factor,                      BUCMIN=2.1026E+00 at pt.13
Smeared stringer/isogrid buckling load factor,BUCMNS=2.1412E+04 at pt. 2
Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
Smeared stringer/isogrid maximum eff. stress, STFMXS=5.9534E+04 at pt. 2
Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
Shell skin maximum effective stress,            SKNMAX=7.7204E+04 at pt.13

Local skin and smeared stiffener buckling and stress, Seg.   6
Skin buckling load factor,                      BUCMIN=2.1012E+00 at pt. 1
Smeared stringer/isogrid buckling load factor,BUCMNS=2.2795E+04 at pt.13
Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
Smeared stringer/isogrid maximum eff. stress, STFMXS=5.5922E+04 at pt.13
Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
Shell skin maximum effective stress,            SKNMAX=7.6941E+04 at pt. 1

Local skin and smeared stiffener buckling and stress, Seg.   7
Skin buckling load factor,                      BUCMIN=2.4313E+00 at pt.13
Smeared stringer/isogrid buckling load factor,BUCMNS=2.2459E+04 at pt. 2
Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
Smeared stringer/isogrid maximum eff. stress, STFMXS=5.6759E+04 at pt. 2
Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
Shell skin maximum effective stress,            SKNMAX=5.4914E+04 at pt. 2

Local skin and smeared stiffener buckling and stress, Seg.   8
Skin buckling load factor,                      BUCMIN=2.0552E+00 at pt.13
Smeared stringer/isogrid buckling load factor,BUCMNS=3.5363E+04 at pt. 2
Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
Smeared stringer/isogrid maximum eff. stress, STFMXS=3.6047E+04 at pt. 2
Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
Shell skin maximum effective stress,            SKNMAX=5.7328E+04 at pt.12

Local skin and smeared stiffener buckling and stress, Seg.   9
Skin buckling load factor,                      BUCMIN=1.4780E+00 at pt.13
Smeared stringer/isogrid buckling load factor,BUCMNS=2.9526E+04 at pt.13
Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
Smeared stringer/isogrid maximum eff. stress, STFMXS=4.3173E+04 at pt.13
Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
Shell skin maximum effective stress,            SKNMAX=7.1739E+04 at pt.12

Local skin and smeared stiffener buckling and stress, Seg.  10
Skin buckling load factor,                      BUCMIN=1.2658E+00 at pt.13
Smeared stringer/isogrid buckling load factor,BUCMNS=1.7213E+04 at pt.13
Smeared ring buckling load factor,              BUCMNR=1.0000E+17 at pt.13
Smeared stringer/isogrid maximum eff. stress, STFMXS=7.4056E+04 at pt.13
Smeared ring maximum effective stress,          STFMXR=0.0000E+00 at pt. 0
Shell skin maximum effective stress,            SKNMAX=1.0559E+05 at pt.13
```

```
 Local skin and smeared stiffener buckling and stress, Seg.  11
 Skin buckling load factor,                        BUCMIN=1.1752E+00 at pt.13
 Smeared stringer/isogrid buckling load factor,BUCMNS=1.6172E+04 at pt. 5
 Smeared ring buckling load factor,                BUCMNR=1.0000E+17 at pt.13
 Smeared stringer/isogrid maximum eff. stress, STFMXS=7.8825E+04 at pt. 5
 Smeared ring maximum effective stress,            STFMXR=0.0000E+00 at pt. 0
 Shell skin maximum effective stress,              SKNMAX=1.1759E+05 at pt.13

 Local skin and smeared stiffener buckling and stress, Seg.  12
 Skin buckling load factor,                        BUCMIN=1.1755E+00 at pt. 1
 Smeared stringer/isogrid buckling load factor,BUCMNS=1.7344E+04 at pt. 2
 Smeared ring buckling load factor,                BUCMNR=1.0000E+17 at pt.13
 Smeared stringer/isogrid maximum eff. stress, STFMXS=7.3495E+04 at pt. 2
 Smeared ring maximum effective stress,            STFMXR=0.0000E+00 at pt. 0
 Shell skin maximum effective stress,              SKNMAX=1.1829E+05 at pt. 2


 The following quantities are used to generate behavioral constraint
 conditions and margins:
                                                    PERTURBED  UNPERTURBED
 Region 1 skin buckling load factor,      bskin1=  2.1026E+00  2.1026E+00
 Region 1 stiffener buckling load factor, bstif1=  2.1412E+04  2.1412E+04
 Region 1 skin maximum effective stress,  sknmx1=  9.5914E+04  9.5914E+04
 Region 1 stiffener max. effective stress,stfmx1=  5.9534E+04  5.9534E+04
 Region 2 skin buckling load factor,      bskin2=  1.1752E+00  1.1752E+00
 Region 2 stiffener buckling load factor, bstif2=  1.6172E+04  1.6172E+04
 Region 2 skin maximum effective stress,  sknmx2=  1.1829E+05  1.1829E+05
 Region 2 stiffener max. effective stress,stfmx2=  7.8825E+04  7.8825E+04
 Normal displacement of shell at apex,     ENDUV=  2.5608E-01  2.5608E-01
=============================================================================N
```

NOTE: The values listed under the headings, “PERTURBED” and “UNPERTURBED” are identical here because this list corresponds to the “fixed” design analysis type in MAINSETUP (**ITYPE = 2**). There are no perturbations of the decision variables in an ITYPE = 2 run of OPTIMIZE. The values of bskin1 and bstif1 are the **minimum** values computed for all the segments in Region 1. The values of bskin2 and bstif2 are the **minimum** values computed for all the segments in Region 2. The values of sknmx1 and stfmx1 are the **maximum** values computed for all the segments in Region 1. The values of sknmx2 and stfmx2 are the **maximum** values computed for all the segments in Region 2. The values of bskin1, bstif1, sknmx1, stfmx1, bskin2, bstif2, sknmx2, stfmx2, and ENDUV are used in the computation of Margins 3, 5, 7, 9, 4, 6, 8, 10, and 11, respectively, listed in Table 75.