



optimized stiffened equivalent ellipsoidal shell; multiplier, PB=0. for inward  $\cos(\theta)$  normal line load.

PA= 0.0 PB= 0.0 PX= 0.0; the shell is unloaded and has a residual dent.  $\Theta x$  -0.00

step 39 displacement w contours for residual dent (PB = 0.)  $\Theta y$  0.00

nonlinear w;  $\cos(\theta)$  point loads along row no. 2 of shell segment no. 2 (see Fig.2)  $\Theta z$  -0.00

subroutine usrfab.soccerball.plastic.src is used with NGCP = 1

9.900E+00

x

Fig. 267 The **optimized isogrid-stiffened equivalent ellipsoidal shell; Wimp=0.2 inch; the optimum design is listed in columns 2 and 3 of Table 33.** State of the shell at load set B (PB) step no. 39 in Run 4 (**residual dent**). (See Fig. 263). Load set B consists of a number of concentrated inward directed normal **loads** applied along row 2 of shell segment 2 (Figs. 2, 169, 258, 259, and 264) distributed in the circumferential direction as  $\cos(\theta)$  from  $\theta = 0$  to 90 degrees. This " $\cos(\theta)$ " load distribution is used because it generates a residual dent that **locally** resembles the negative of the buckling modal deformation in Figs. 258 and 259, that is, the negative of the linear buckling modal imperfection with  $n = 1$  circumferential wave. Compare with Fig. 240. Here the residual dent is somewhat deeper than the depth, Wimp=0.2 inch, of each of the two axisymmetric buckling modal imperfections, mode 1 and mode 2, for which the optimum design was obtained.