

APPENDIX D: User Defined Airbag Sensor

The addition of a user sensor subroutine into LS-DYNA is relatively simple. The sensor is mounted on a rigid body which is attached to the structure. The motion of the sensor is provided in the local coordinate system defined for the rigid body in the definition of material model 20—the rigid material. When the user defined criterion is met for the deployment of the airbag, a flag is set and the deployment begins. All load curves relating to the mass flow rate versus time are then shifted by the initiation time. The user subroutine is given below with all the necessary information contained in the comment cards.

```

      subroutine airusr (rbu,rbv,rba,time,dt1,dt2,param,hist,itron,
.   rbug,rbvg,rbag,icnv)
c
c*****
c|   Livermore Software Technology Corporation   (LSTC)           |
c|   -----                                     |
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c*****
c
c      user subroutine to initiate the inflation of the airbag
c
c      variables
c
c      displacements are defined at time n+1 in local system
c      velocities are defined at time n+1/2 in local system
c      accelerations are defined at time n in local system
c
c      rbu(1-3) total displacements in the local xyz directions
c      rbu(3-6) total rotations about the local xyz axes
c      rbv(1-3) velocities in the local xyz directions
c      rbv(3-6) rotational velocities about the local xyz axes
c      rba(1-3) accelerations in the local xyz directions
c      rba(3-6) rotational accelerations about the local xyz axes
c      time is the current time
c      dt1 is time step size at n-1/2
c      dt2 is time step size at n+1/2
c      param is user defined input parameters
c      hist is user defined history variables
c      itrnon is a flag to turn on the airbag inflation
c      rbug,rbvg,rbag, are similar to rbu,rbv,rba but are defined
c                      globally.
c      icnv is the airbag ID
c
c      the user subroutine sets the variable itrnon to:
c
c          itrnon=0 bag is not inflated
c          itrnon=1 bag inflation begins and this subroutine is
c                  not called again
c
c      include 'iounits.inc'
c      dimension rbu(6),rbv(6),rba(6),param(25),hist(25),
.   rbug(6),rbvg(6),rbag(6)
c
c      itrnon=0
c      ra=sqrt(rba(1)**2+rba(2)**2+rba(3)**2)
c      if (ra.gt.param(1)) then
c          itrnon=1

```

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```
        write(iotty,100) time
        write(iohsp,100) time
        write(iomsg,100) time
    endif
100  format (' Airbag activated at time ',1pe10.3)
c
    return
end
```