6.0> Manufacturing Integration ("plyshape" & "spring-back")

(A) "plyshape"

This example uses geometry obtained from a CAD system to provide experience of a realistic geometry incorporating complex ply shapes.

- Create new database plyshape.db
  - Import file plyshape.igs
  - Set angles to "-90 0 90" to obtain default view
  - Switch labels on
  - Set point size to 10
  - Create trimmed surfaces describing ply and central hole
    - Create curves on Surface 1.2,1.3,1.4,2.3 using Transform Curve Translate
    - Break curves on edges of surfaces at intersection points
    - Create chain curves surrounding trimmed regions
    - Create trimmed surfaces
    - Mesh surfaces with a global edge length of 2.0 using paver
    - Equivalence
  - Play session file materials.ses to create materials
  - Open Laminate Modeler using a new Layup File
    - Create a scissor draped material with default values
    - Create a scissor draped ply with the origin at the front of the surface, an initial direction along the Z-axis, and covering all elements
    - Create a similar ply, but only covering the surface of the central hole
    - Import the outlines of both plys. These constitute the inner and outer boundaries of the ply.

- Set angles to “0 0 0” to view the flat pattern

If your have difficulty with this exercise, examine or play the session file plyshape.ses after opening a new database.

(B) “springback”

This example illustrates the use of composites analysis for predicting process phenomena like springback. While accurate analysis is limited by available materials data and element formulation at this stage, even simple linear analyses can give valuable clues on likely behaviour during processing.

- Create new database springback.db
  - Play session file springback_geom.ses to generate geometry
  - Play session file materials.ses to create materials
  - Open Laminate Modeler with a new Layup file
    - Create LM_material using ud_t300_n5208 properties and a thickness of 0.25 (mm)
    - Create LM_Ply_000 with origin point [1250 0 1250] and initial vector along the global X-axis
      - (Notice that the wrap direction in not parallel to the edges of the body)
    - Create LM_Ply_045, LM_Ply_090 and LM_Ply_135 at reference angles of 45, 90 and 135 degrees respectively
    - Create LM_Layup with $[0.45/90/135]_6$
      - unsymmetrical to illustrate potential problem)
      - Generate and apply Laminated Materials
    - Close Laminate Modeler
  - Fix lower edge in translation and rotation
  - Create a nodal temperature load of -155 over the whole body
  - Analyze default subcase, setting ply and element stresses
  - Read in results, plot max.deformation

If your have difficulty with this exercise, examine or play the session file springback.ses after opening a new database.