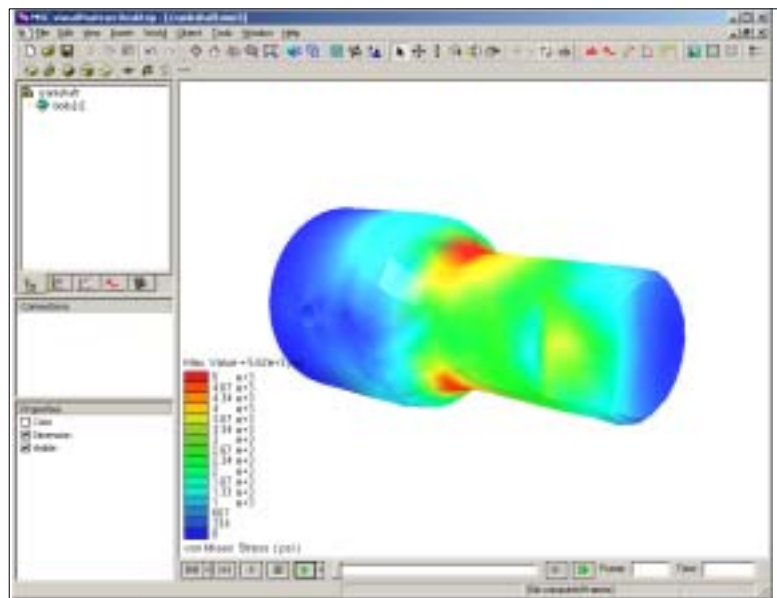C H A P T E R   3

Viewing and Visualization

Exercise 3-1   View a Piston Model

Objectives

In this exercise you will learn to

- Annotate a model using text, pointer, and group annotations.
- Run and stop a simulation.
- Change an object's appearance.
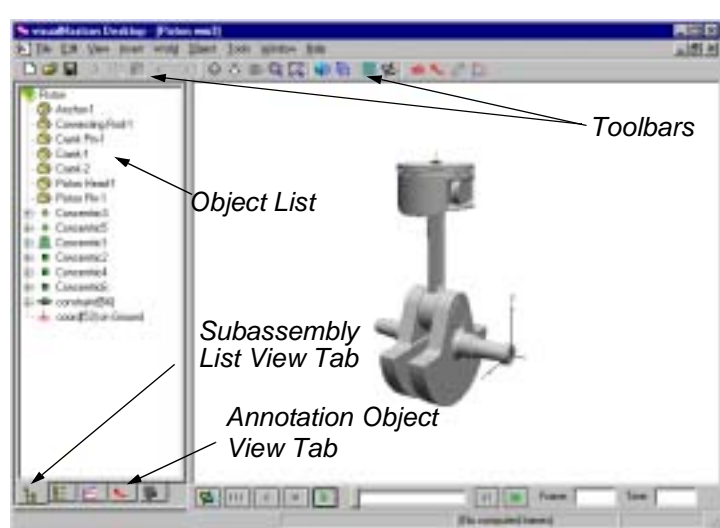- Use a tool to measure parts and insert dimensions.

Software

MSC.visualNastran 4D, MSC.visualNastran Desktop FEA, or MSC.visualNastran Motion

Support Files

- Tutorials\Chapter 03\Exercise 3.1\Piston.wm3

1. Launch MSC.visualNastran Desktop.

2. Choose **Open** from the **File** menu.

3. Browse the **Tutorials\Chapter 03\Exercise 3.1** folder and open the file **Piston.wm3**.

NOTE: The default location for the Tutorials folder is **Program Files\visualNastran Desktop.**

Figure 3-1
Modeling Window

The piston displays in the modeling window, as shown in **Figure 3-1**. This is just one of many types of files you can open using MSC.visualNastran Desktop.

Annotate the Model

Next, you will create a title annotation for the model.

1. Click the **Text** button on the **Annotation Toolbar**, or choose **Annotation>Text** from the **Insert** menu.

The annotation cursor — a small cross-hair — displays when you move over the assembly.

2. Position the cursor under the piston model and click to place the annotation. The annotation is anchored to the background. Otherwise, it follows the body on which it is placed.

The **Insert Annotation** window is displayed.

Figure 3-2
Insert Annotation Window

Enter Annotation Text

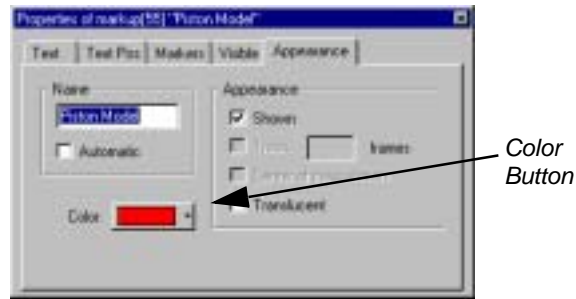You may also access the **Insert Annotation** window using the buttons on the **Annotation Toolbar**.

3. Type Piston Model in the **Label** text region and optionally specify the appearance, color, and text of the note.

4. Click **OK**. The note appears according to your specifications.

Change the Annotation Style

1. Click the **Pointer Annotation** tab beneath the **Object List** to display the annotation list.

2. Double-click the **Text Annotation** entry in the **Object list**. to display its **Properties** window.

3. Click the **Appearance** tab.

Figure 3-3
Properties Window
(Appearance Page)

*Color
Button*

4. Click the **Color** button and select a new color from the standard color options.

The annotation color changes on the screen.

5. Click the **Text** tab and click the **Font** button to display the **Font** dialog.

6. Select **18pt Bold** font and click **OK.**

You can also specify the font color here.

7. Close the **Properties** window.

Place a Pointer Annotation

Now you will place an annotation that calls out a part.

1. Click the **Pointer Annotation** button on the **Annotation Toolbar**, or choose **Pointer Annotation** from the **Insert** menu.

2. Click the piston head to place the arrowhead endpoint.

If a location on a body is clicked, the pointer annotation will always point to that body.

3. Click again to place the annotation text.

Once the annotation is placed, the **Insert Annotation** window displays.
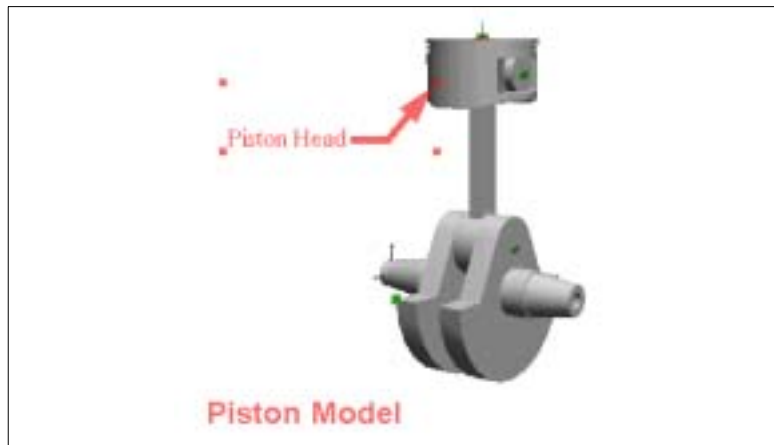
Figure 3-4
Insert Annotation Window

Enter Annotation Text

4. Type Piston Head in the **Label** text region and optionally specify appearance, arrow dimensions, and the color and text of the label.

5. Click **OK** and close the window.

The label appears according to your specifications.

Figure 3-5
Annotated Piston

6. Click the **Rotate** tool and drag the piston, or use the arrow keys to rotate the piston.

Note that the pointer remains attached to the model.

NOTE: The **Fix Text** checkbox (in the **Insert Annotation** window) controls the behavior of annotations during simulation and animation. When text is fixed, only the arrowhead moves with the body to which it is attached. When the **Fix Text** checkbox is not selected, the annotation text and the arrow move with the body part.

Place a Group Annotation

You can annotate groups of parts, too.

For example, to annotate the Crank portion of the piston model:

1. Click the **Subassembly List View** tab under the Object window.

2. Select **Crank-1**, **Crank-2**, and **Crank Pin-1** in the Object list (by pressing the **Ctrl** key while clicking each object).

3. Choose **Annotation**, then **Group** from the **Insert** menu.

This displays the **Insert Annotation** window and encloses the group of parts in an ellipse.
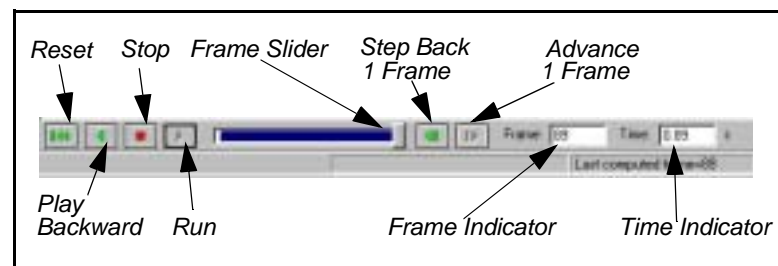
4. Type Crank Subassembly in the text region and optionally specify appearance, arrow dimensions, and the color and text of the label.

In the **Insert Annotation** window, you can specify markers for the group annotation: **Show arrow** and **Show ellipse**.

Play Back the Simulation/Animation

Figure 3-6
Tape Player Control

1. Click the **Run** button on the **Tape Player Control** as shown in **Figure 3-6**. Let the simulation run for about 200 frames.

2. Click the **Stop** or **Reset** button on the **Tape Player Control**.

The **Stop** button simply stops the simulation, leaving the last frame calculated, whereas the **Reset** button stops the simulation and resets to the initial condition.

Change an Object's Appearance

To change the color of the connecting rod:

1. Right-click the **Connecting Rod-1** entry in the Object list.

2. From the pop-up menu that appears, choose **Properties** to view the **Properties** window.

3. Click the **Appearance** tab in the **Properties** window.

Figure 3-7
Properties Window
(Appearance Page)

Click to change connecting rod color

4. Click the **Color** button. Select the color red and click **Close**.

To make the piston head translucent:

1. If the **Properties** window is still open, click the piston head. (If the **Properties** window is not open, right-click the piston head and select **Properties**.)

2. Click the **Appearance** tab in the **Properties** window.

3. Click the **Translucent** checkbox to select it.

Add Dimension Labels

To apply radial dimensions:

Radial dimensioning measures the radius of arcs and the diameter of circular features.   When you use the radial dimensioning tool, MSC.visualNastran Desktop automatically detects circular features in your model and highlights them in blue arcs.

1.   Click the **Radial Dimension** button on the **Annotation Toolbar**, or choose **Radial Dimension** from the **Insert** menu.

Blue lines highlight the arcs in the piston.

2.   Move the cursor over an arc.

The radial dimension cursor — a cross-hair inside an ellipse— displays when you move it over a blue line.

3.   Click the arc.

The radial dimension displays with an **R** indicating radius or **D** indicating diameter.

You can edit the dimension style just like that of the pointer and text annotations— through the **Appearance** and **Annotation** pages of the **Properties** window. Dimension text color is always black.

To apply distance dimensions:

The **Distance Dimension** tool measures the distance between vertices, edges and arc centers in any combination.

4.   Click the **Distance Dimension** button on the **Annotation Toolbar**, or choose **Distance Dimension** from the **Insert** menu.

The distance dimension cursor — a cross-hair between hash marks— displays when you move over an edge of a body.

5.   Click the cursor on any edge of the piston.

When you click, the cross-hair marks the mid-point of the edge.

6.   Move the cursor to a parallel body edge and click it.

MSC.visualNastran Desktop calculates and annotates the dimension.
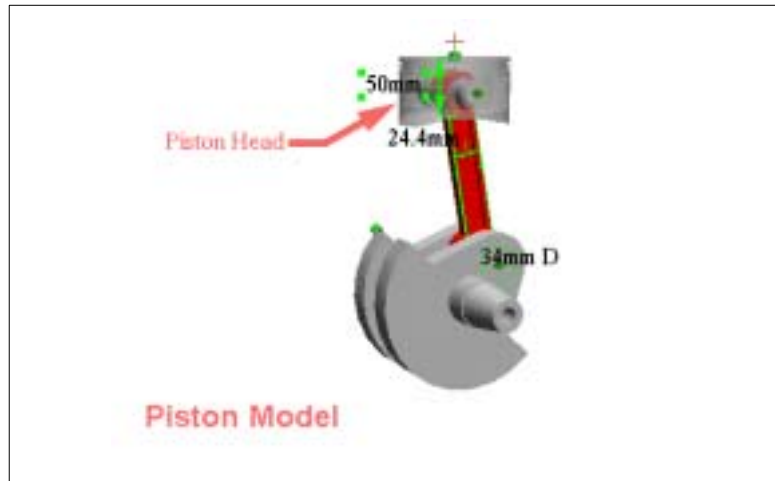
7. Repeat steps 1 - 3 to measure the crank.

NOTE: Consider dimensioning the distance between the crank and the piston head. When the simulation is running this dimension will automatically update.

---

8. Click the **Run** button on the **Tape Player Control**.

Like the text annotation, the dimensions float with the simulation.

Figure 3-8
Annotated, Dimensioned
Piston during Simulation

You can edit the appearance of the dimension and dimension text the same way you edited these items for the radial dimension.

Exercise 3-2   View an MSC.Nastran Output (.XDB) File

Objectives

In this exercise you will learn to

• View XDB files.

Software

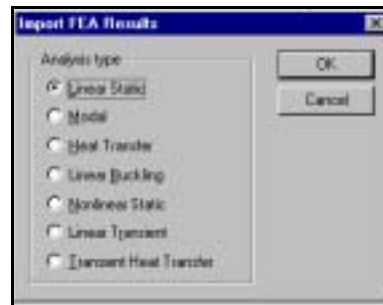MSC.visualNastran 4D, MSC.visualNastran Desktop FEA, or MSC.visualNastran Motion

Support Files
- Tutorials\Chapter 03\Exercise 3.2\crankshaft.xdb
- Tutorials\Chapter 03\Exercise 3.2\ViewXBD.zip
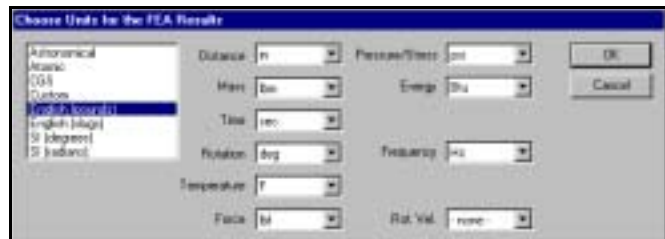
Prepare the .XDB File for Viewing

1. Launch MSC.visualNastran Desktop.

2. Choose **Open** from the **File** menu.

3. Browse the **Tutorials\Chapter 03\Exercise 3.2** folder and open the file **crankshaft.xdb**.

This is a model that was run with MSC.Nastran to generate the XDB file. This is just one of many types of files you can open using MSC.visualNastran Desktop.

Figure 3-9
Import FEA Results Dialog

4. From the **Import FEA Results** dialog, select **Linear Static** for the simulation type and click **OK**.

This dialog will prompt you for the simulation type of the MSC.Nastran output XDB file.

Figure 3-10
Units Dialog

Since MSC.Nastran output is unitless, you must define the units for the simulation.

5.   Select **English (pounds)** for the units. Click **OK**.

This displays the crankshaft and pops up the **FEA Display Settings** window which allows you to optionally change the display.

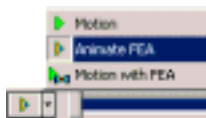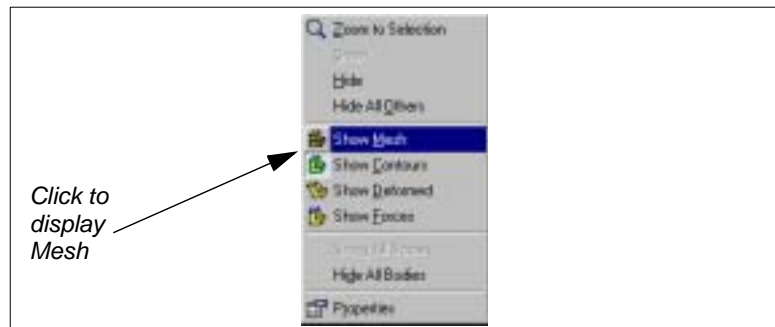6.   Close the **FEA Display Settings** window.

Visualize FEA Results

Once you have read the FEA results from the XDB file, you can spin, pan, and zoom to examine the model. Follow the steps below to modify the FEA results visualization.

1.   Right-click the crankshaft body and select **Show Mesh**.

This renders the crankshaft in mesh display mode.

Figure 3-11
Pop-up Menu
for Bodies

Click to display Mesh

2.   Click the arrow to the right of the **Play** button and select **Animate FEA**.

3.   Click the striped **Play** button to animate the current FEA results.

This will create 20 frames of animated results, cycling between maximum and zero load.

4.   Stop the animation using the **Tape Player** controls.

Annotate the model

1. Click the **Text** button on the **Annotation Toolbar** or choose **Annotation**, then **Text** from the **Insert** menu.

The annotation cursor — a small cross-hair — displays when you move over the modeling window.

2. Position the cursor over the crankshaft to place the annotation.

The annotation is anchored to the background. Otherwise, it follows the body on which it is placed.

3. In the **Insert Annotation** window, enter an annotation in the **Label** text region and optionally specify the appearance, color and position of the note.

4. Click **OK**.

Open Other .XDB Files

For other examples of MSC.visualNastran Desktop viewing capabilities, unzip the file **ViewXDB.zip**. This zipped file contains several XDB files of different types. When accessing these files, refer to the table below for parameters required to open each model.

File	Analysis Types	Element Types
aero_xdb_heat	heat transfer	TETRA (quadratic)
brack_trn	linear transient	QUAD4
guitar modal	modal	QUAD4
towermodal	modal	BAR, CONM
chap53s	nonlinear static	QUAD4
platebeam	linear static	QUAD4, BAR
vanbody	linear static	QUAD4, TRIA3, RBE2, CELAS, CONM
panel_rod_transheat	transient heat	QUAD4, BAR