

Chapter 15

Complex Animation

Learning Objectives

After completing this chapter, you will be able to:

- *Create dummy objects*
- *Create snapshot objects*
- *Hide objects during animation*
- *Animate and link camera*



INTRODUCTION

In this chapter, you will learn to animate the objects using the dummy objects. Dummy objects are used to control the movement of other objects by linking them. If several objects are linked to a dummy object, the dummy can be used to move all objects simultaneously. The objects linked to the dummy can also be moved individually without affecting the dummy object or any other object linked to the dummy object.

TUTORIAL

Before starting the tutorial, you need to download the *c15_3dsmax_2017_tut.zip* file from www.cadcim.com. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2017 for Beginners: A Tutorial Approach*

Extract the contents of the zip file and save them in the *Documents* folder.

Tutorial 1

In this tutorial, you will create the animation of a steel manufacturing process. You will create dummy objects to assist in movement during animation, refer to Figure 15-1.

(Expected time: 35 min)



Figure 15-1 Animation at different frames

The following steps are required to complete this tutorial:

- a. Create the project folder.
- b. Open the file.
- c. Create dummy objects.
- d. Link the objects.
- e. Set continuity value.
- f. Animate the hook and cauldron.
- g. Add a position key.
- h. Create a snapshot.

- i. Hide the object during animation.
- j. Hide the object using object properties.
- k. Preview the animation.
- l. Set the camera view.
- m. Save and preview the animation.

Creating the Project Folder

Create the project folder with the name *c15_tut1* in the *3dsmax 2017* folder, as discussed in earlier chapters.

Opening the File

1. Choose **Open** from the **Application** menu; the **Open File** dialog box is displayed. In this dialog box, browse to the location `\Documents\c15_3dsmax_2017_tut` and select the `c15_tut1_start.max` file from it. Choose the **Open** button to open the file, refer to Figure 15-2.

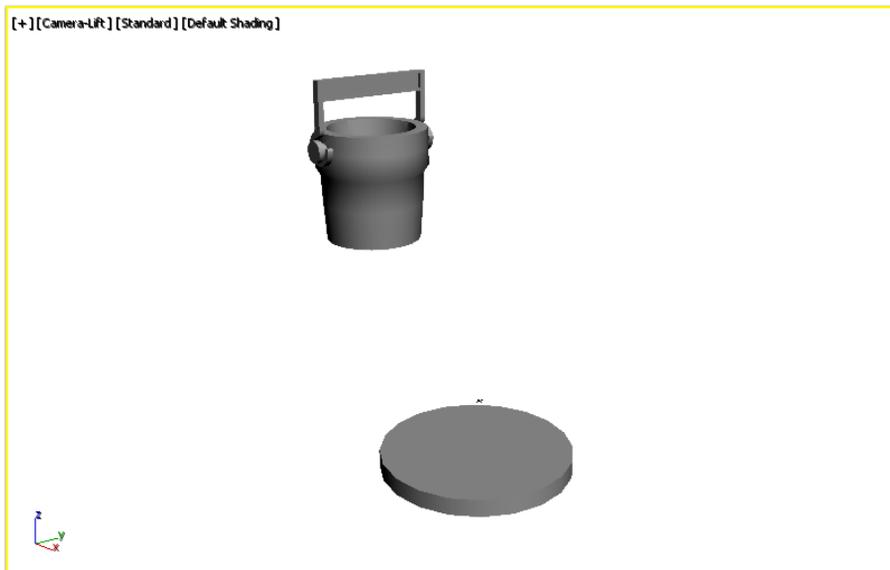


Figure 15-2 The *c15_tut1_start.max* file

2. Choose **Save As** from the **Application** menu; the **Save File As** dialog box is displayed. Browse to the location `\Documents\3dsmax 2017\c15_tut1\scenes`. Save the file with the name *c15tut1.max* at this location.

Creating Dummy Objects

In this section, you will set the number of frames in the animation and create the dummy objects.

1. Choose the **Time Configuration** button from the animation playback controls; the **Time Configuration** dialog box is displayed, as shown in Figure 15-3.
2. In the **Animation** area, set **150** in the **Length** spinner and choose the **OK** button; the total number of frames for the animation is set to 150.

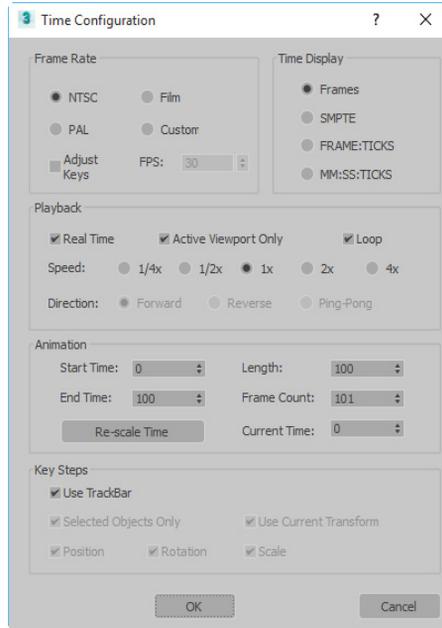


Figure 15-3 The *Time Configuration* dialog box

3. Choose **Create > Helpers** in the **Command Panel**. Next, invoke the **Dummy** tool from the **Object Type** rollout. 
4. Restore the four viewports configuration and activate the Front viewport by clicking on it.
5. Click at a point below *Cauldron* and drag the mouse to create a small cube. Next, move the cube in the Left viewport to position it below *Cauldron*; a dummy object is created, as shown in Figure 15-4.

The size of the cube does not matter. This cube is the dummy object and will not be visible in the rendered animation. Resize the cube so that you can select it easily, yet not so large that it interferes with the selection of other objects in your scene.

6. Enter **Cal-Dummy** in the **Name and Color** rollout.
7. Invoke the **Dummy** tool again from the **Object Type** rollout. In the Front viewport, click at a point below *Base* and drag the cursor to create another small cube. Adjust the position of the cube in the Left viewport to position it below *Base*, as shown in Figure 15-5.
8. Enter **Base-Dummy** in the **Name and Color** rollout.
9. Activate the Top viewport. Next, use the **Align** tool from the **Main Toolbar** to center *Base-Dummy* with the center of the *Base* object along the X and Y axes. Also, align the center of *Cal-Dummy* with the center of *Cauldron* along the X and Y axes. 

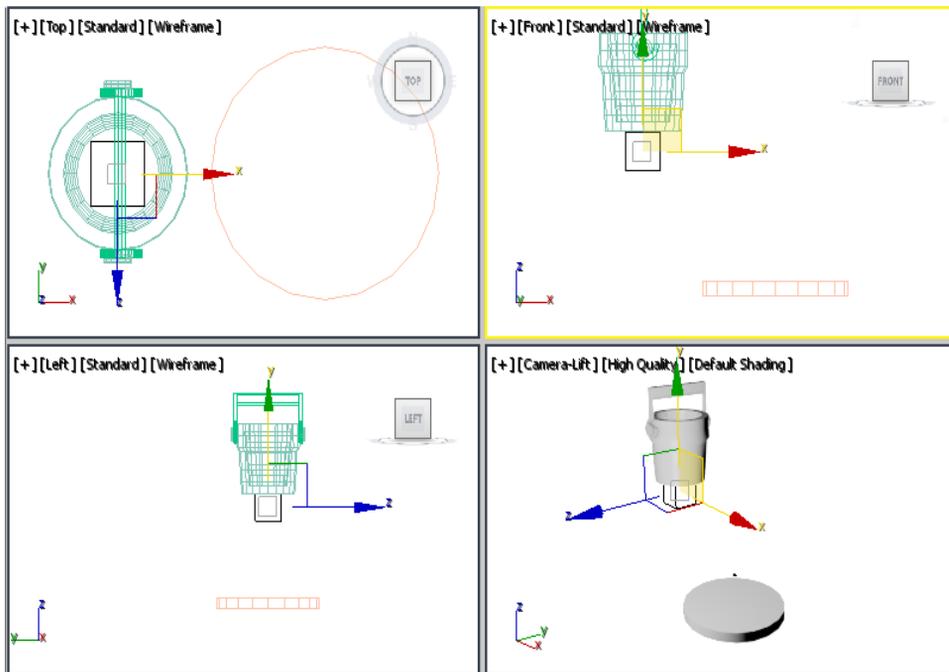


Figure 15-4 A dummy object created

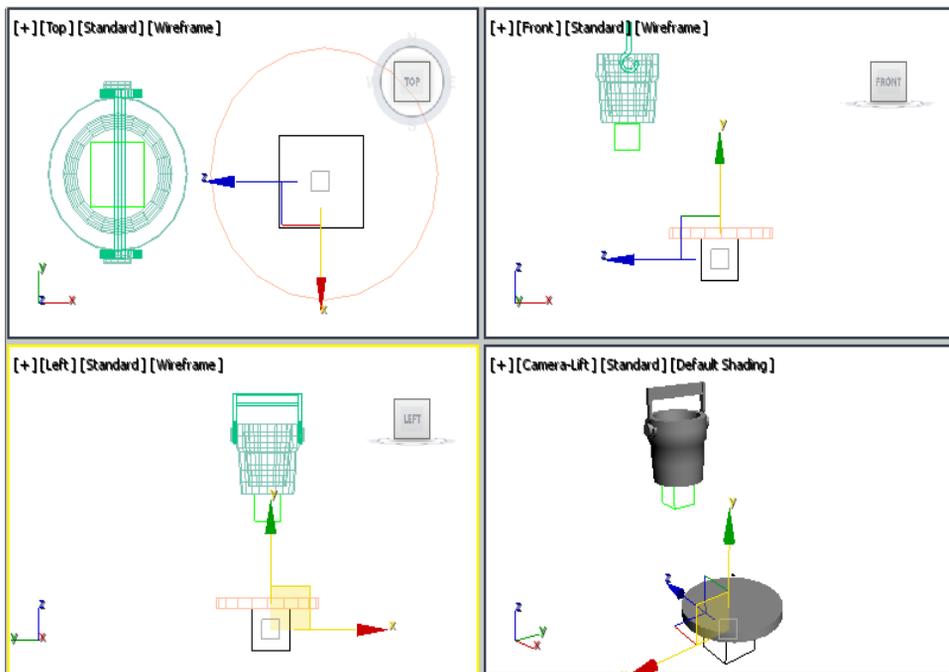


Figure 15-5 Adjusting the position of the cube below Base

Linking the Objects

In this section, you will link the objects in the scene. Linking more than one object to a dummy object simplifies the animation process and allows individual movement later in the animation.

1. Invoke the **Select and Link** tool from the **Main Toolbar**. 
2. Click *Cauldron* and drag the cursor to *Cal-Dummy* and then release the left mouse button, refer to Figure 15-6. Invoke the **Select Object** tool to exit the tool.

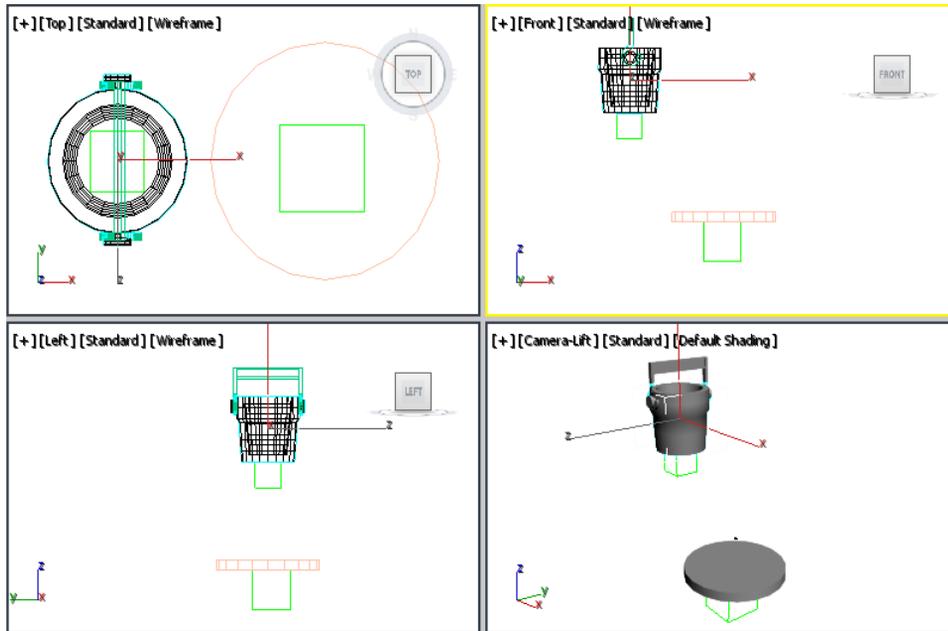


Figure 15-6 Linking Cauldron with Cal-Dummy

When the first object is selected, the link cursor appears. On dragging the mouse button and releasing it on the second object, the two objects will be linked. *Cauldron* becomes a child of *Cal-Dummy* and will follow its movement.

3. Choose the **Select and Link** tool. Next, click *Hook*, drag the cursor to *Cal-Dummy*, and release the left mouse button. Invoke the **Select Object** tool to exit the tool; *Hook* becomes a child of *Cal-Dummy* and follows its movement.
4. Choose the **Select and Link** tool. Next, click *Base*, drag the cursor to *Base-Dummy*, and release the left mouse button; *Base* becomes a child of *Base-Dummy*. Now, invoke the **Select Object** tool to exit the tool.

Setting Continuity Value

In this section, you will set the continuity value using the **Set Controller Defaults** dialog box. Continuity controls an object's movement through animation keys, creates the appearances of life-like motion, or creates the appearances of mechanical motion. The objects in this animation should have mechanical motion. A continuity default value can be set before creating animation keys so that each key does not have to be individually adjusted later.

1. Choose **Customize > Preferences** from the menu bar; the **Preference Settings** dialog box is displayed. Next, choose the **Animation** tab in the **Preference Settings** dialog box.
2. In the **Controller Defaults** area, choose the **Set Defaults** button; the **Set Controller Defaults** dialog box is displayed, as shown in Figure 15-7.
3. In this dialog box, select **TCB Float** from the list and then choose the **Set** button; the **TCB Default Key Values** dialog box is displayed, as shown in Figure 15-8.

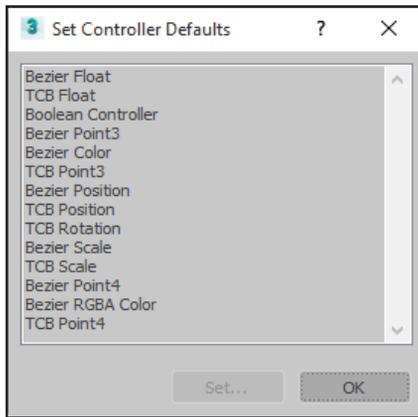


Figure 15-7 The *Set Controller Defaults* dialog box

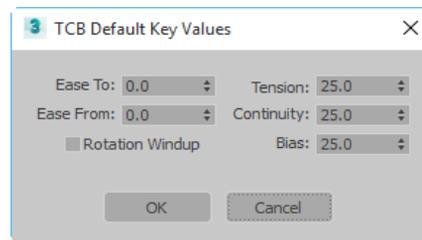


Figure 15-8 The *TCB Default Key Values* dialog box

4. In this dialog box, set the value **0** in the **Continuity** spinner and then choose the **OK** button.
5. Choose **OK** in the **Set Controller Defaults** dialog box. Next, choose **OK** in the **Preference Settings** dialog box.

Animating the Hook and Cauldron

In this section, you will animate *Hook* and *Cauldron*. To create an animation, a series of keys are defined.

1. Choose the **Toggle Auto Key Mode** button to turn the animation mode on (red). 

When the **Toggle Auto Key Mode** button is chosen (red), any transformation creates an animation key on the current frame. If this button is off, the transformation is applied to frame 0, regardless of the current frame.

2. Drag the time slider to frame 25. Alternatively, you can set the value **25** in the spinner at the left side of the **Time Configuration** button.
3. Activate the Front viewport and click *Cal-Dummy*. Next, right-click on the **Select and Move** tool; the **Move Transform Type-In** dialog box is displayed, refer to Figure 15-9.
4. Set the value **300** in the **X** spinner of the **Offset:Screen** area and press the ENTER key; *Cauldron* is now centered over *Base*.

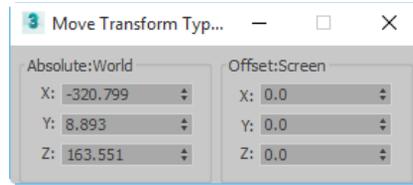


Figure 15-9 The Move Transform Type-In dialog box

- Drag the time slider to frame 50.
- Make sure *Cal-Dummy* is selected. In the **Move Transform Type-In** dialog box, set **-300** in the **Y** spinner of the **Offset:Screen** area and press the ENTER key; *Cauldron* is placed on *Base*, refer to Figure 15-10.

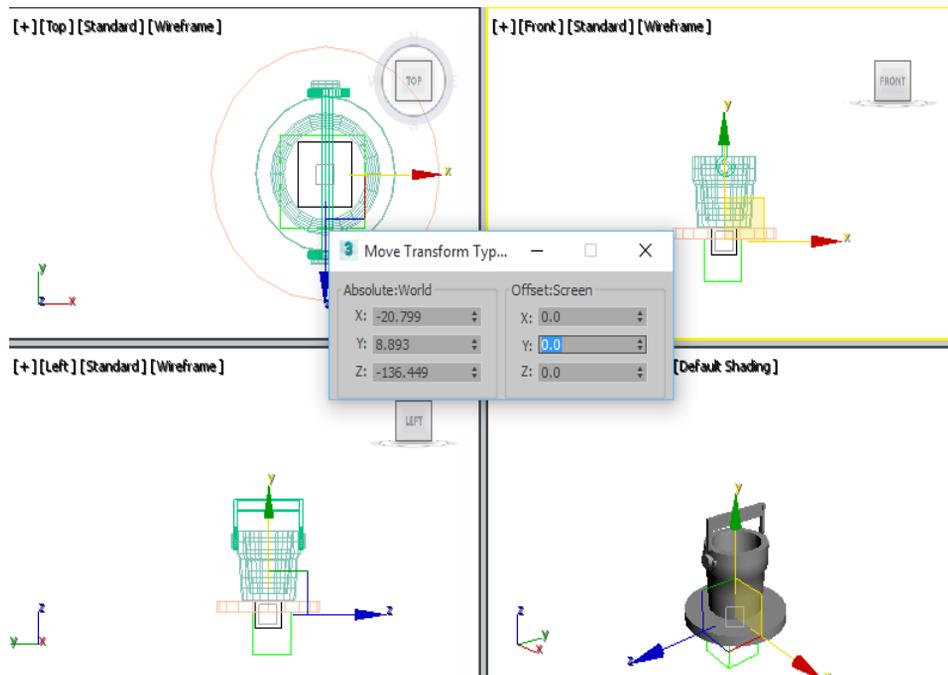


Figure 15-10 The Cauldron placed on the circular Base

- Close the **Move Transform Type-In** dialog box and exit the animation mode by choosing the **Toggle Auto Key Mode** button.

Adding a Position Key

If the movement of *Hook* is animated, the movement would begin at frame 0 and would end at the active frame that was current when *Hook* was moved. As a result, *Hook* would gradually drift away from its parent object. To prevent this, *Hook* needs a position key added at frame 50. The position key locks the *Hook's* position at frame 50. Any movement applied to *Hook* affects only frames between frame 50 and the current frame. In this section, you will use the different frame settings in the **Track View - Dope Sheet** window to create the position key.

1. Select all objects in the viewport. Next, choose **Graph Editors > Track View - Dope Sheet** from the menu bar; the **Track View - Dope Sheet** window is displayed.
2. In this window, click on the plus sign at the left of **Hook** and then click on the plus sign at the left of **Transform**. Notice that currently there are no animation keys for *Hook*.
3. Choose the **Add/Remove Key** button on the upper left of the **Track View - Dope Sheet** window.
4. Click on the **Position** track for *Hook* at frame 50; a position key for *Hook* is created at frame 50, refer to Figure 15-11. Next, close the **Track View - Dope Sheet** window.

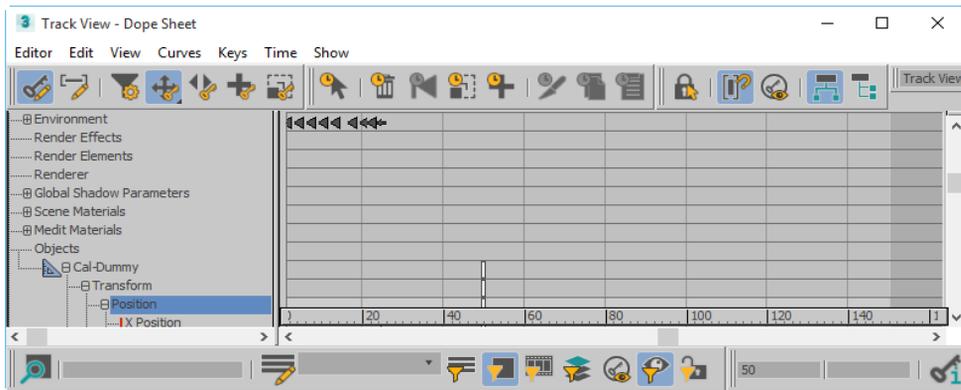


Figure 15-11 The new key added to the *Hook*'s **Position** track

5. Drag the time slider to frame 55 and choose the **Toggle Auto Key Mode** button.
6. Select *Hook* in the Front viewport. Move *Hook* –60 units on the X axis and –60 units on the Y axis; *Hook* is detached from *Cauldron*.
7. Drag the time slider to frame 70. Next, move *Hook* 300 units on the Y axis.
8. Choose **Graph Editors > Saved Track Views > Track View - Dope Sheet** from the menu bar; the **Track View-Dope Sheet** window is displayed with the previous settings active.
9. Choose the **Add/Remove Key** button on the upper left of the **Track View-Dope Sheet** window.
10. Zoom in the window and add a key in the **Position** track at frame 90 for *Hook*. Next, close the **Track View-Dope Sheet** window; the current position of *Hook* is recorded in a key at frame 90.
11. Choose the **Absolute Mode Transform Type-In** button; it is replaced by the **Offset Mode Transform Type-In** button.
12. Drag the time slider to frame 105. Next, in the Front viewport, move *Hook* –300 units on the Y axis.

13. Drag the time slider to frame 110. Next, move *Hook* 60 units on the X axis and 60 units on the Y axis; *Hook* is reattached to *Cauldron*.
14. Choose **Graph Editors > Saved Track Views > Track View-Dope Sheet** from the menu bar; the **Track View-Dope Sheet** window is displayed. Next, select *Cal-Dummy* in the viewport and click on the plus sign on the left of **Cal-Dummy** and then **Transform** in the **Track View-Dope Sheet** window.
15. Choose the **Add/Remove Key** button and add a key in the **Position** track at frame 110 for *Cal-Dummy*. Next, close the **Track View-Dope Sheet** window.
16. Drag the time slider to frame 130.
17. In the Front viewport, move *Cal-Dummy* 300 units on the Y axis; *Cal-Dummy*, *Hook*, and *Cauldron* move.
18. Drag the time slider to frame 150.
19. Move *Cal-Dummy* -300 units on the X axis.
20. Choose the **Toggle Auto Key Mode** button to exit the animation mode. Next, drag the time slider to left and right to replay the animation. Alternatively, choose the **Play Animation** button to see the animation in the viewport.

Creating a Snapshot

The **Snapshot** tool duplicates an object in its current state, but unlike the **Copy** tool, it does not copy any animation keys associated with the object. The snapshot copy can then be used for complex animation sequences. In this section, you will create a snapshot of *Cauldron* and rotate it by 45 degrees.

1. Drag the time slider to frame 50. Next, select *Cauldron*.
2. Choose **Tools > Snapshot** from the menu bar; the **Snapshot** dialog box is displayed, as shown in Figure 15-12.
3. Make sure the **Single** radio button is selected in the **Snapshot** area. Also, select the **Copy** radio button in the **Clone Method** area, and then choose **OK** to close the dialog box.

A duplicate copy of *Cauldron* is created at the same location as the original. Therefore, the copy of *Cauldron* had to be moved to frame 50. The copy is named as *Cauldron001*.



Note

The **Snapshot** dialog box allows you to create multiple copies over a range of frames using the **Range** radio button or a single copy using the **Single** radio button.

4. Drag the time slider to frame 0.

There are now two cauldrons in the scene: the original and the copy located at the original's position at frame 50 when the snapshot was made.

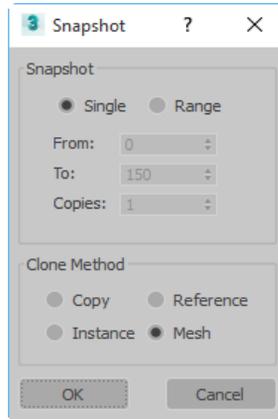


Figure 15-12 The *Snapshot* dialog box

5. Invoke the **Select and Link** tool from the **Main Toolbar**.
6. Click and drag *Cauldron001* to *Base Dummy*, as shown in Figure 15-13. Release the left mouse button and invoke the **Select Object** tool to exit the tool; *Cauldron001* is now the child of *Base Dummy* and will follow its movement.

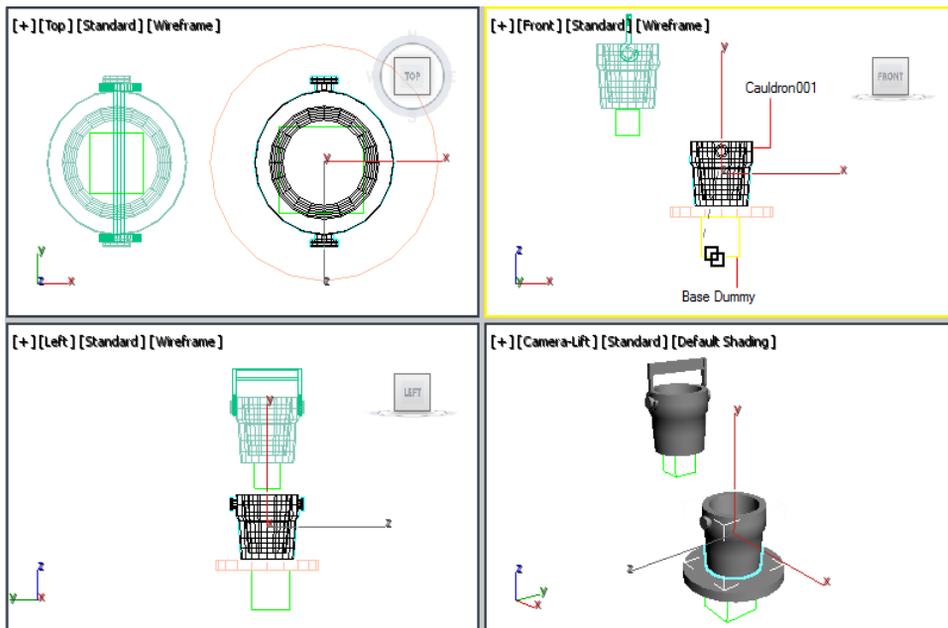


Figure 15-13 Linking *Cauldron* with *Base-Dummy*

7. Select *Base Dummy* in the viewport.
8. Choose **Graph Editors > Saved Track Views > Track View-Dope Sheet** from the menu bar; the **Track View-Dope Sheet** window is displayed. Next, click on the (+) plus sign at the left of **Base-Dummy** and **Transform**.

9. Make sure the **Add/Remove Key** button is activated and add a key in the **Rotation** track at frame 70 for *Base Dummy*. Next, close the **Track View - Dope Sheet** window. 
10. Drag the time slider to frame 80. Choose the **Toggle Auto Key Mode** button to enter the animation mode.
11. In the Front viewport, rotate *Base Dummy* object – 45 degrees on the Z axis, as shown in Figure 15-14.
12. Drag the time slider to frame 90. In the Front viewport, rotate *Base Dummy* +45 degrees on the Z axis, as shown in Figure 15-15.

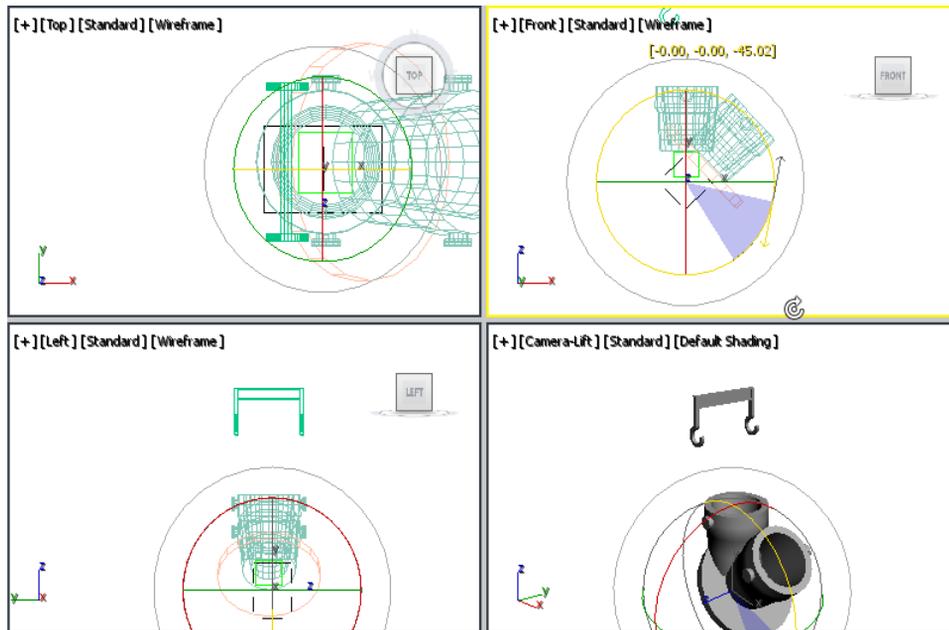


Figure 15-14 Rotating Base-Dummy -45 degrees on the Z axis

13. Choose the **Toggle Auto Key Mode** button to exit the animation mode. Next, drag the time slider left and right to replay the animation.

Hiding the Object During Animation

All parts of the animation are now completed, but there are two cauldrons visible during the animation. You must turn off the visibility, or hide the cauldrons during different segments of the animation. In this section, you will hide object using the **Track View - Dope Sheet** window. There are two ways to do this. You can use the **Track View - Dope Sheet** window or modify the object's properties.

1. Select *Cauldron* in the viewport. Next, choose **Graph Editors > Saved Track Views > Track View-Dope Sheet** from the menu bar; the **Track View - Dope Sheet** window is displayed.
2. Select **Cauldron** in the **Track View - Dope Sheet** window. Click on the (+) plus sign at the left of *Cauldron*.

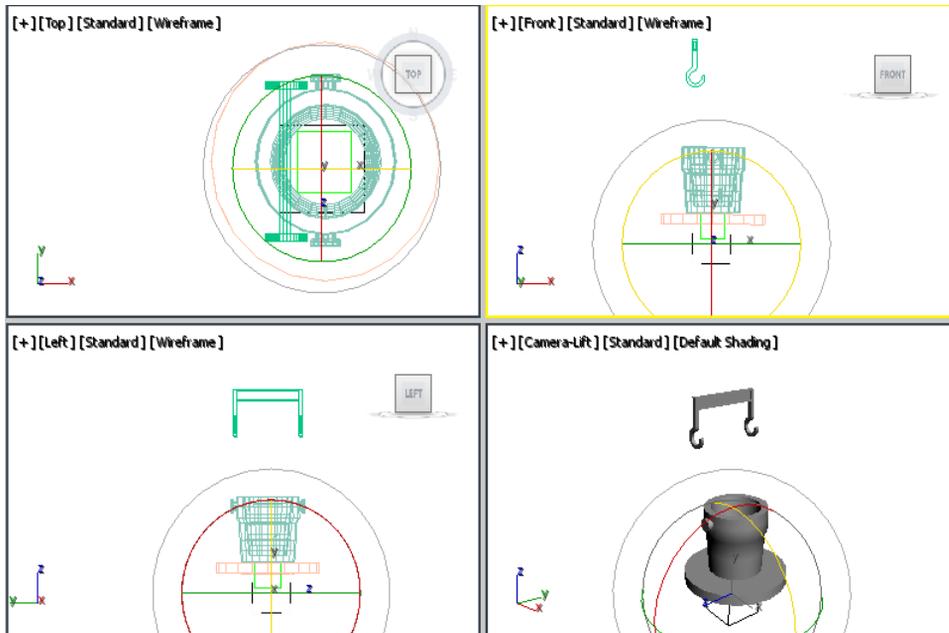


Figure 15-15 Rotating Base-Dummy +45 degrees on the Z axis

3. Choose **Edit > Visibility Tracks > Add** from the menu bar in the **Track View - Dope Sheet** window; a visibility track is added for **Cauldron**.
4. Choose the **Add/Remove Key** button and add a key in the **Visibility** track at frame 0 for **Cauldron**, refer to Figure 15-16.

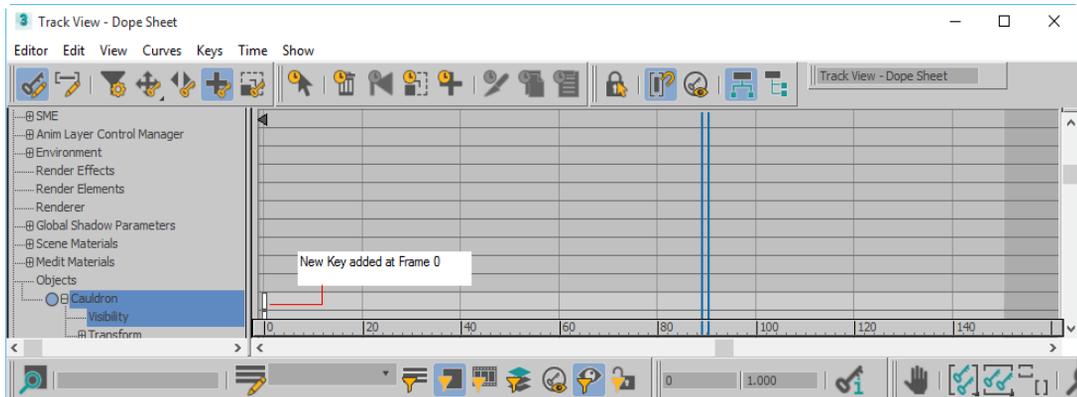


Figure 15-16 Adding a new key in the **Visibility** track at frame 0

5. Right-click on the new key; the **Cauldron/Visibility** dialog box is displayed. In this dialog box, make sure **1.0** is set in the **Value** spinner. Also, set the **In** and **Out** image tiles to the square mechanical transition, refer to Figure 15-17. Do not close the **Cauldron/Visibility** dialog box; **Cauldron** is fully visible at frame 0.

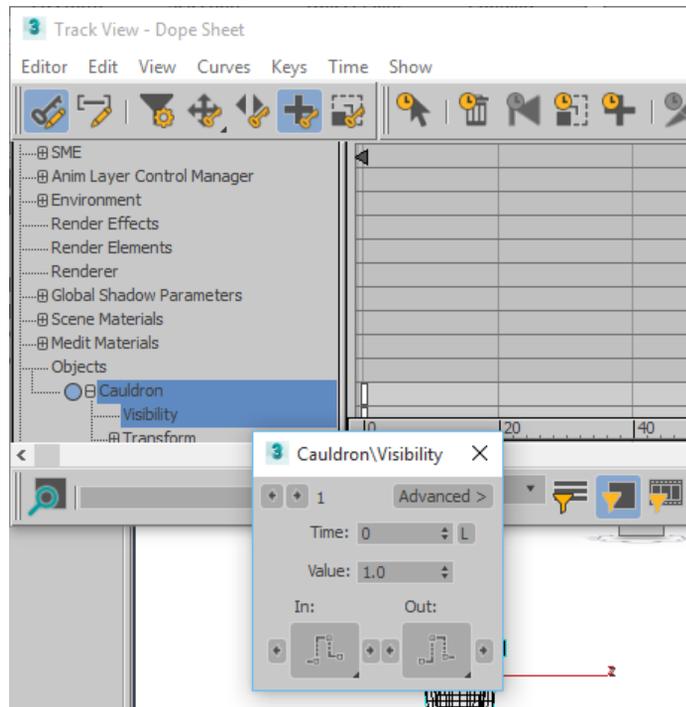


Figure 15-17 The *Cauldron/Visibility* dialog box

6. Add a key in the **Visibility** track at frame 50 for *Cauldron*.
7. In the **Cauldron/Visibility** dialog box, set the value **0** in the **Value** spinner. Also, set the **In** and **Out** image tiles to the square mechanical transition; *Cauldron* is invisible at frame 50. Close the **Cauldron/Visibility** dialog box.
8. Add a key in the **Visibility** track at frame 90 for *Cauldron*.
9. Right-click on the new key; the **Cauldron/Visibility** dialog box is displayed. In this dialog box, set the value **1.0** in the **Value** spinner. Also, set the **In** and **Out** image tiles to the square mechanical transition; *Cauldron* is fully visible at frame 0. Next, close the **Cauldron/Visibility** dialog box and the **Track View-Dope Sheet** window.

Hiding the Object Using Object Properties

In this section, you will hide the objects using the object properties.

1. Drag the time slider to frame 0.
2. Select *Cauldron001* in any viewport. Right-click in the viewport; the quad menu is displayed. Choose **Object Properties** from the lower-right quadrant of the quad menu; the **Object Properties** dialog box is displayed, as shown in Figure 15-18.

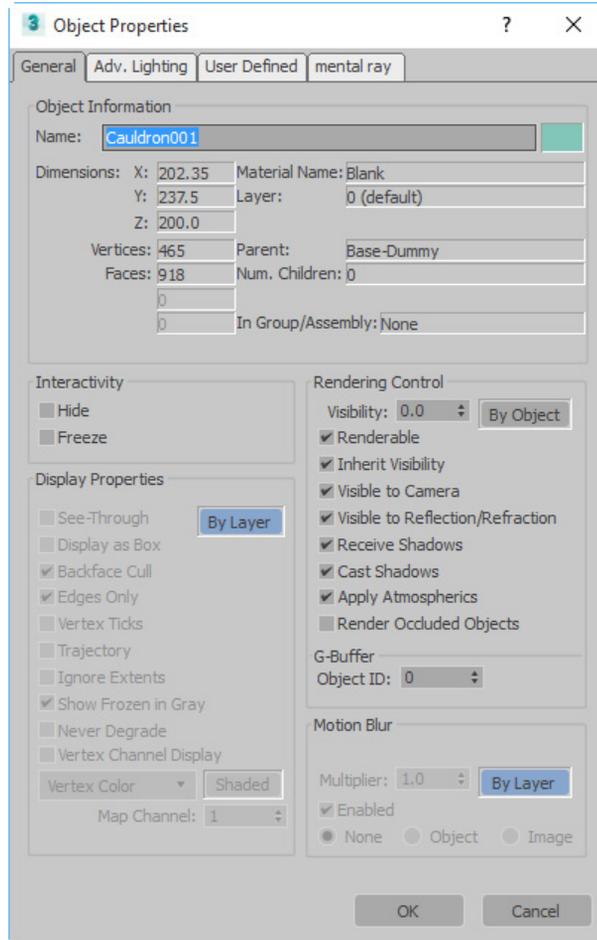
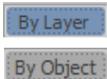


Figure 15-18 The Object Properties dialog box

- In this dialog box, make sure the **By Object** button is activated; Also, the options in this area are activated.



Note

If the **By Layer** button is already displayed in the **Object Properties** dialog box, you need to change it with **By Object** button.

- Set the value **0** in the **Visibility** spinner. Next, choose the **OK** button to close the **Object Properties** dialog box; *Cauldron001* is invisible at this frame (frame 0). This also adds a visibility track in the **Track View - Dope Sheet** window.
- Drag the time slider to frame 50 and then choose the **Toggle Auto Key Mode** button to enter the animation mode.
- Make sure *Cauldron001* is selected. Next, right-click in the viewport; the quad menu is displayed. Next, choose **Object Properties** from the quad menu; the **Object Properties** dialog box is displayed.

7. Set the value **1.0** in the **Visibility** spinner of the **Object Properties** dialog box.

You will notice that the corners of the spinner turn red. This indicates that the parameter is animated.

8. Choose the **OK** button to close the **Object Properties** dialog box; *Cauldron001* becomes visible at frame 50.
9. Drag the time slider to frame 90. Make sure *Cauldron001* is selected. Next, right-click in the viewport; the quad menu is displayed. Next, choose **Object Properties** from the quad menu.
10. Set **0** in the **Visibility** spinner of the **Object Properties** dialog box. Next, choose the **OK** button to close the **Object Properties** dialog box; *Cauldron001* is invisible at frame 90.
11. Choose the **Toggle AutoKey Mode** button to exit the animation mode. Drag the time slider left and right to replay the animation.

You will notice that *Cauldron001* fades in and out. Therefore, you need to adjust the transition in the **Track View - Dope Sheet** window.

12. Choose **Graph Editors > Saved Track Views > Track View-Dope Sheet** from the menu bar; the **Track View-Dope Sheet** window is displayed. In this window, click on the plus sign on the left of **Cauldron001** to expand the tree, if it is not already expanded.
13. Right-click on the first key in the **Visibility** track; the **Cauldron001/Visibility** dialog box is displayed. In this dialog box, set the **In** and **Out** image tiles to the square mechanical transition.
14. Repeat this for the visibility keys at frame 50 and frame 90. Close the **Cauldron/Visibility** dialog box and the **Track View-Dope Sheet** window.
15. Drag the time slider left and right to preview the animation or choose the **Play Animation** button.

Notice that *Cauldron001* no longer fades in and out. The visibility changes for both cauldron objects are instantaneous, providing the illusion that there is only one cauldron in the scene.

Previewing the Animation

In this section, you will preview the animation. The preview animation is a low resolution/low color format used to quickly verify that the animation is working correctly.

1. Make sure the Camera-Lift viewport is activated.
2. Choose **Tools > Preview - Grab Viewport > Create Preview Animation** from the menu bar; the **Make Preview** dialog box is displayed, as shown in Figure 15-19.

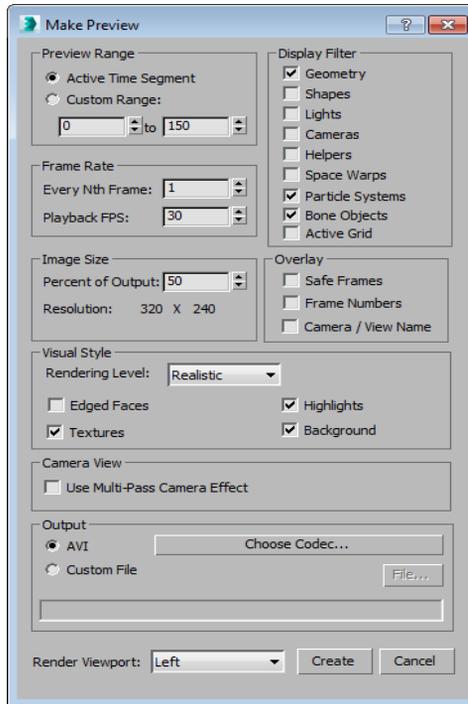


Figure 15-19 The Make Preview dialog box

3. In this dialog box, select the **Frame Numbers** check box in the **Overlay** area. Next, choose the **Create** button. If the **Video Compression** dialog box is displayed, choose **OK** to accept the default settings.

When the animation is completed, it is played in Windows Media Player. Notice that the invisible cauldrons will not appear clearly. This is just a representation in the preview rendering. In the final animation, the cauldrons are completely invisible.

Setting the Camera View

In this section, you will set the camera view so that all objects are visible throughout the animation.

1. Choose the **Display** tab in the **Command Panel**. 
2. In the **Hide by Category** rollout, clear the **Cameras** check box; the camera named *Camera-Lift* is displayed in the scene.
3. Invoke the **Zoom Extents All** tool; the scene is zoomed out in the viewports so that the camera and target fit on the screen.
4. Set the Camera-Lift and Camera-Lift.Target in all viewports so that all objects in the scene are visible throughout the animation, refer to Figure 15-20.

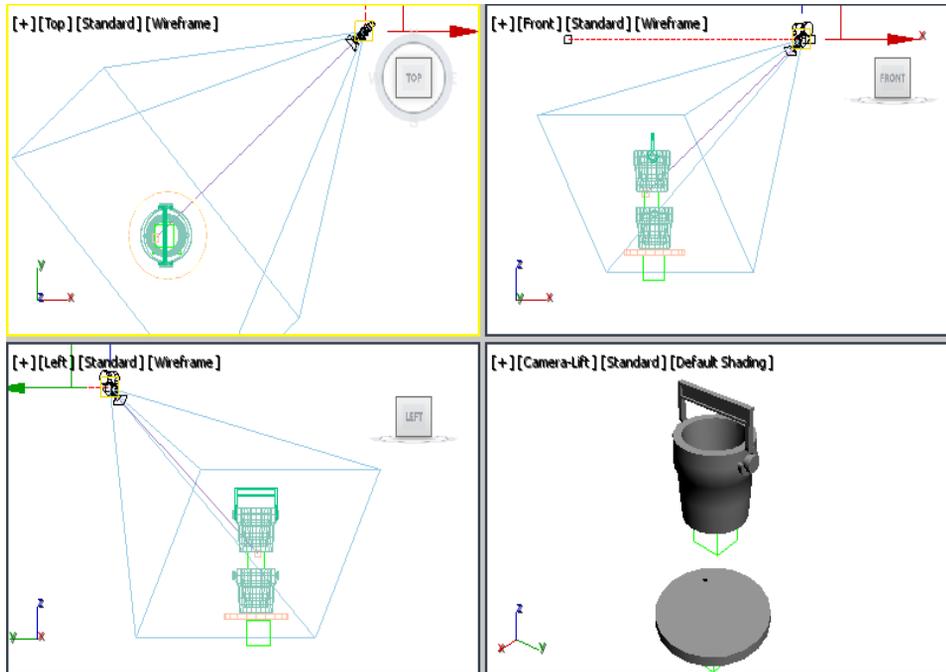


Figure 15-20 Adjusting the Camera-Lift and Camera-Lift.Target in all viewports

Next, you will preview the animation to view the effect of moving the camera.

5. Make sure the Camera-Lift viewport is activated.
6. Choose **Tools > Preview - Grab Viewport > Create Preview Animation** from the menu bar; the **Make Preview** dialog box is displayed.
7. In this dialog box, choose the **Create** button. If the **Video Compression** dialog box is displayed, choose the **OK** button to accept the default settings.

Saving and Previewing the Animation

In this section, you will create a quick preview of the updated animation to show the movement of the camera target.

1. Change the background color of the scene to white by following the steps, as given in Tutorial 1 of Chapter 2.
2. Choose **Save** from the **Application** menu.
3. Make sure the Camera-Lift viewport is activated.
4. Choose **Tools > Preview - Grab Viewport > Create Preview Animation** from the menu bar; the **Make Preview** dialog box is displayed.

5. Choose the **Create** button. If the **Video Compression** dialog box is displayed, choose the **OK** button to accept the default settings.

When the animation is completed, it is played in the Windows Media Player.

Self-Evaluation Test

Answer the following questions and then compare them to those given at the end of this chapter:

1. Which of the following tools is used to duplicate an object in its current state, but does not copy any animation key associated with the object?
 - (a) **Copy**
 - (b) **Dummy**
 - (c) **Snapshot**
 - (d) None of these
2. An object can be _____ to a dummy object, and it will then follow the movement of the dummy object.
3. A dummy object will not be visible on _____.
4. The _____ window can be used to create a position key.
5. While adjusting the key information of a key in an object's visibility track, the setting of _____ in the **Value** spinner will make the object completely visible.
6. An object can be made invisible by creating a visibility track in **Track View - Dope Sheet** window, or by adjusting the object's _____.
7. When a camera is animated, both _____ and _____ can be moved or rotated.
8. On selecting _____ in the **Display Properties** rollout of the **Command Panel**, camera's path is displayed in the viewport.
9. Frames that have animation keys for the camera are indicated in the trajectory by white boxes. (T/F)

Review Questions

Answer the following questions:

- Which of the following dialog boxes is used to set the total number of frames in animation?
 - Set Controller Defaults
 - Time Configuration
 - Object Properties
 - None of these
- The _____ objects are used to control the movement of other objects by linking them, but are not rendered.
- The _____ tool is used to link one object with another object.
- The _____ button is used to add keys in **Track View - Dope Sheet**.
- The _____ option verifies the current state of animation.
- The **Snapshot** tool is similar to the **Copy** command. (T/F)

EXERCISE

The rendered sequence of the scene used in the following exercise can be accessed by downloading the *c15_3dsmax_2017_exr.zip* from www.cadcim.com. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2017 for Beginners: A Tutorial Approach*

Exercise 1

Extract the contents of the *c15_3dsmax_2017_exr.zip* and then open *c15_exr01_start.max*. Next, animate the vise, refer to Figures 15-21 through 15-24.

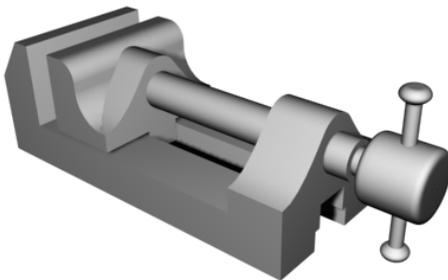


Figure 15-21 Animation at frame 50

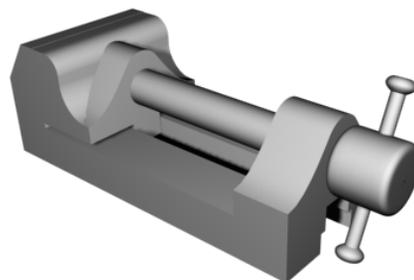


Figure 15-22 Animation at frame 75

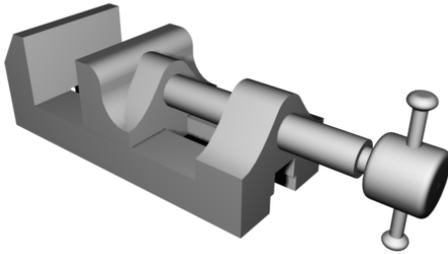


Figure 15-23 Animation at frame 125

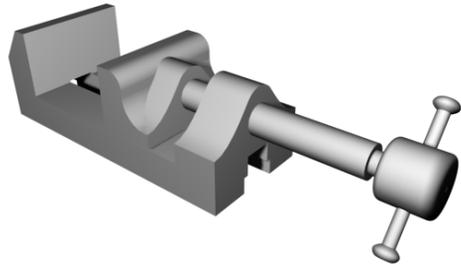


Figure 15-24 Animation at frame 150

Answers to Self-Evaluation Test

1. c, 2. linked, 3. rendering, 4. Track View - Dope Sheet, 5. 1.0, 6. properties, 7. camera, target, 8. Trajectory, 9. T