Chapter 18: Dragonfly Tutorial - Trace Images

This tutorial demonstrates how to get started modeling an object using photographs as reference material.

You will learn how to:

- Trace an image to create profile curves.
- Create cross-section curves for lofting the profiles.
- Edit control points to change a surface shape.

Note: The top and side views are actually of different specimens of this dragonfly. In the side view, the wings are folded up. We will be using the side view image only to draw the side view curves of the body.

Draw the body

Since the dragonfly is symmetrical in the top view, and the model is not going to be a scientific reproduction, trace one side of the dragonfly and mirror the curve to the other side. For the side view, draw two curves since the profile is not symmetrical. Then we will loft cross section curves to make the body. The head will be made separately.

The tail and body will all be made in one piece. The tail is actually several segments that flex. If you were making an animation or a scientific model, you probably would want to divide the dragonfly into smaller surfaces.

Start the model
1. Begin a **New** model.
2. In the **Template File** dialog box, select **Small Objects - Millimeters.3dm**, and click **Open**.

### Draw a reference line
- In the Top view use the **Line** command to draw a reference line **50 millimeters** long starting at 0,0,0.

### Place the top view image
1. Start **PictureFrame** command.
   - In the **Tutorial Models** folder that you downloaded with the *User’s Guide*, you will find the images you need for this exercise.
2. Find the image file **DragonFly Top.jpg**, and place the image in the **Top** viewport.
   - Use the reference line to set the length of the picture frame image.

### Move the image into place
- Use object snaps to **Move** the image from the midpoint of the left side (**Mid**) to the construction plane origin at 0,0,0.

### Place the side view image
1. Start **PictureFrame** command.
   - In the **Tutorial Models** folder that you downloaded with the *User’s Guide*, you will find the images you need for this exercise.
2. Find the image file **DragonFly Side.jpg**, and place the image in the **Front** viewport.
Use the reference line to set the length of the picture frame image.

3. Using **Ortho, drag** the image down in the **Front** viewport until the reference line matches the center of the dragonfly body.

**Prepare the view**

- **Hide** the side view picture frame.

**Draw the outline curve**

- In the **Top** viewport, use the **Curve** command to draw an outline of the top half of the dragonfly body.

  Use as many control points as you think are necessary for the detail.

  Draw only up to the neck. You will be creating the head another way.
Mirror the curve

- In the Top viewport, use the Mirror command to copy the curve around the reference line. The photograph shows that the dragonfly is not symmetrical about its center line. However, since your dragonfly will be stylized, it does not matter in this case. You can choose the level of accuracy you need.

Show the side view image

- Use the Show command to show the side-view picture frame object.

Bend the curve

- In the Front viewport, use the Bend command to bend the curves down at the tail to match the bend in the body curve in that view.
Trace side-view body

In the Front viewport, use the Curve command trace the body outline using two curves, one above the reference line and one below the reference line. Maximize the viewport and zoom in. Pick as many points as you need to create the curves. Use more points when rounding a corner and fewer points for a straight section.

Prepare the view

Hide the picture frame objects and the reference line.

Create the body surface

Use the CSec command to create cross-section profile curves through the top, bottom, and side curves. Draw as many cross-section curves as you need to maintain the detail. You will be able to see whether you have enough curves when you loft the surface in the next step. If you do not have enough curves to maintain the shape in an area, add more and retry the surface loft.

Loft the body

1. Select all the cross-section curves you just created.
2. Use the Loft command to create a surface through the cross-section profiles.
Dr. the head

Draw the head with an ellipsoid and move the control points around to deform the head. The eyes are also ellipsoids. The neck is a surface blend.

1. Use the **Ellipsoid** command with the **Diameter** option to start the ellipsoid in the **Front** viewport.

2. Use **Elevator Mode** to position the first point.
   - At the **Start of first axis** prompt, press and hold the **Ctrl** key and in the Top viewport click near the side of the head.

3. In the **Front** viewport, move the cursor up to the center of the head in the side view and click.

2. At the **End of first axis** prompt, turn on **Ortho** in the **Top** viewport, click at the other side of the head.
3. At the **End of second axis** prompt, draw pick a point in the **Front** viewport to establish the head size from front to back.
   Watch the preview in the **Top** viewport to check the overall size.

4. At the **End of third axis** prompt, pick a point in the **Front** viewport at the top of the head.

   **Note**: Drawing the ellipsoid in this order and using these viewports is important to get the poles of the ellipsoid in the right place for the next step.
Rebuild the ellipsoid

- Use the **Rebuild** command to add more control points to the ellipsoid.
  Set the point count to **16** in the u-direction and **10** in the v-direction.

Drag control points to shape the head

1. Use the **PointsOn** command to turn on control points for the ellipsoid.

2. In the **Top** viewport, select and drag points on both sides of the ellipsoid toward the back to deform the head.
3. In the Right viewport, drag the middle two rows of points down.

**Blend the head and body**

The neck is a blend surface between the head shape and the body. First, you are going to trim the head shape to make an opening.

- **Trim the neck**
  - In the Front viewport, draw lines as illustrated and use the **Trim** the head and body shapes with the lines.

- **Blend the neck and body**
  - Use the **BlendSrf** command to make a blend surface between the head and body. Be sure the seams are aligned and the direction arrows point the same way.
Draw the eyes

The eyes are simple ellipsoids.

**Draw the base ellipsoid**

- Use the **Ellipsoid** command to draw the eye.
  Base the size and position on the images.

**Position the eye**

- Use the **Move** and **Rotate** commands or the **Orient** command to adjust the position of the eye.

**Mirror the other side.**
Use the **Mirror** command to copy the eye to the other side.

Shape the tail

The end of the tail has a rounded shape cut out of it. Use a Boolean to make this shape.

1. **Cap the body**
   - If necessary, extend the tail section by turning on the control points and dragging them to match the bitmap.
   - Use the **Cap** command to make the body into a solid.

2. **Draw a cutting cylinder**
   - Use the **Cylinder** command to draw a solid cylinder so it cuts through the tail as illustrated.

3. **Boolean the tail**
   - Use the **BooleanDifference** command to cut the end out of the tail.
Trace the wings

The wings are solids created from closed curves. The legs are created by tracing a polyline down the center of a leg and using a pipe surface to make a series of tubes around the polyline.

Draw the outline curve

- In the Top viewport, use the Curve command to trace the wings on one side of the dragonfly.

Extrude the curve to make a solid

- Make the curves into thin solids with the ExtrudeCrv command. Set the command-line option Solid=Yes to Yes.
Move the wings into position

- Position the wings on the back with the Move command. Consult the side view image of the dragonfly. The front wing is slightly higher than the back wing.

Mirror the wings to the other side

- Use the Mirror command to copy the wings to the other side.

Draw the legs

Draw the base polyline

1. In the Top viewport, use the Polyline command to trace down the center of the legs.
2. Edit the control points to position the legs in the Top and Front viewports. You will have to use your imagination a little for this since the two pictures do not show the legs of the same insect.

Pipe the legs

- Use the Pipe command to draw the legs around the polylines.
Refer to the background picture to determine the starting and ending diameter of the pipe.

**Mirror the legs**

- Use the **Mirror** command to copy the legs to the other side, or draw different legs for the other side.

**Finishing touches**

- Add **materials** and **textures** and **render**.