

Introduction to Macromedia® Flash

A Workshop for San Diego State University Faculty and Staff



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Introducing Flash

Flash is a program by Macromedia for creating interactive, animated online content. *Animated* simply means "to have movement" -- Flash content does not have to be a cartoon. It is commonly used to mimic software interface elements such as scroll bars, drop-down menus, buttons, and navigational systems. The term "Flash" has also come to mean the actual files created using Macromedia's program of the same name.

Not only is Flash content animated, it is interactive, allowing the user to experience unique results based on input. This generates creative gaming content such as the "Who Wants to be a Millionaire" online game at ABC.com.

How to get Flash

If you don't have a copy of the Macromedia Flash software, you can download a 30-day trial version from <http://www.flash.com>.

Scalable Vector Graphics

Yet another benefit to Flash content is that much of it is rendered as Scalable Vector Graphics (SVG). It is much more efficient to download SVG-format file than a GIF or JPEG image. Vectors are mathematical curves that describe the edges of shapes. Imaging programs like Adobe Photoshop render artwork with pixels --also known as *rasters* -- which are fairly memory-intensive. The advantage of vectors is shown in Figure 1-1.

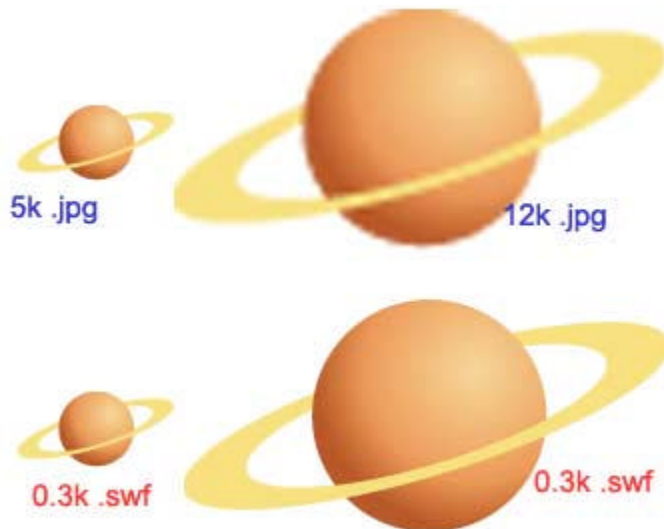


Figure 1-1: The smaller Saturns are displayed at 100%. The enlarged raster-based .jpg is blurry, and takes more memory to render. The vector-based .swf file can display at any size without requiring more memory or degrading in quality.

The SVG implementation is only now being standardized by the World Wide Web Consortium. The Flash format is the *de facto* standard, due to Macromedia's early trailblazing, but Adobe has introduced LiveMotion, which saves files in the preliminary SVG format adopted by the W3C, as well as in the Flash format. (Assuming the non-proprietary SVG format is adopted by future Web browsers, Macromedia will no doubt add that capability to Flash.)

Flash versus Shockwave

Flash is Macromedia's program for creating animated movies specifically for online presentation.

Shockwave is a format for saving Macromedia Director files for online presentation (Director is a more robust program for creating movies; it has a higher degree of interactivity, plus video -- something Flash can't include. It is the standard for authoring CD-ROM presentations).

Both Director and Flash save movies in the Shockwave/Flash (.swf) format for online playback. Users must have the browser plug-in present in order to view this format. Unlike Director -- which is quite complex and utilizes Lingo, a proprietary programming language -- Flash was built specifically for online authoring, and despite many interface similarities, is much simpler. It does utilize ActionScripts, a basic set of program commands that is much easier to learn than Lingo or JavaScript.

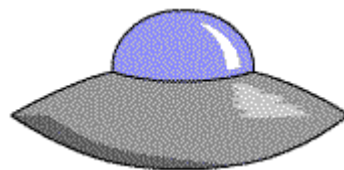
Lesson 1

The Toolbox



The basic drawing tools in Flash are the Line, Oval, Rectangle, Pencil, Brush, and Eraser tools. When a tool is selected, the lower half of the Toolbox displays modifiers unique to that tool. In your copy of Flash, move your cursor over the image of the toolbox to view the various modifiers. In the case of the Oval and Rectangle tools, the modifiers are the stroke color, stroke weight, stroke style, and fill color. It's best to get in the habit of setting these modifiers before using the tool, as editing color takes a few more steps.

To draw a flying saucer like the one below, select the Oval tool and change the default red fill to a medium gray. Click on the Fill modifier and drag into the color palette that pops up (Figure 1-3).



Flying saucer

Figure 1-2: The Flash Toolbox.



Figure 1-3: The color palette.

This palette contains the 216 Web colors (colors that won't dither in Mac OS or Windows). Once you have set the stroke and fill, draw an oval on the page.

The Danger of Segmenting

Anything you draw in Flash automatically segments itself. That means the oval you drew is actually two objects: the gray fill and the black stroke. If you tried to pick up the shape and move it, you probably moved one or the other (fortunately, Flash has unlimited undos). To select the entire shape, either marquee it with the Lasso or Arrow tool, or double-click the fill with the Arrow tool. Flash indicates a filled object is selected by displaying a checkerboard pattern on it. A selected stroke displays a crosshatch pattern (Figure 1-4).

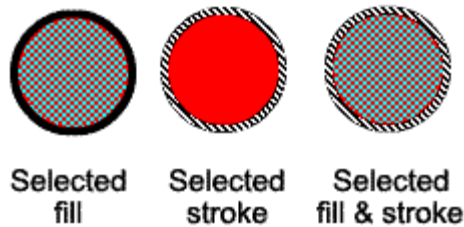


Figure 1-4: Select the fill, stroke, or both.

Deselect by clicking on the Stage (background). Use the line tool to horizontally bisect the ellipse you drew. You now have seven shapes on the Stage (Figure 1-5).



Figure 1-5: Automatic segmenting (exploded for clarity).

To prevent this segmenting, you can group objects as soon as you draw them, but sometimes segmenting works to your advantage -- as it will in the next two examples.

Undo the line (choose Undo from the Edit menu, or press Command-Z (Mac) or Control-Z (Windows) and any repositioning you may have done (select Edit > Undo as many times as it takes to get back to your original gray ellipse) will be undone.

To add corners to the ends of the ellipse, be sure that it is not selected and position the Arrow cursor close to one end (do not click). A small curve will appear next to the cursor, indicating that if you drag, you will reshape the curve. Hold the Option key (Mac) or Alt key (Windows) and drag the end of the ellipse to add a corner.

Grids and Snapping

By default, the Snap to Grid feature is active, which causes the cursor to move abruptly and at irregular intervals. This is rarely convenient; disable it by unchecking Snap to Grid from the View menu. The View menu is also where you can make the grid visible or invisible. To set the color and spacing of the gridlines, choose Modify > Movie.

Add a corner to the other end of the ellipse by pressing Option (Mac) or Alt (Windows) and dragging the opposite side.

To draw the canopy of the saucer, select the Oval tool and set the Fill modifier to a pale blue. Draw a circle on the page away from the body of the saucer (hold down the Shift key to draw a perfect circle). If you had let the canopy overlap the saucer, it would have punched out the underlying part of the saucer. (If this happened, just select Undo from the Edit menu.)

To punch out the bottom of the canopy, rather than the top of the saucer, double-click the fill of the saucer (which selects it and its stroke) and position it to cover the lower half of the canopy. Deselect it by clicking on the white Stage.

The bottom of the canopy can be changed to a concave curve by moving the Arrow next to it (until you see a curve icon next to the cursor) and dragging downward. Notice how the fills of both the canopy and saucer body adjust to this change. Select the entire canopy by clicking the blue fill and Shift-clicking the strokes above and below the canopy. Group them by choosing Modify > Group.

Details can be added to the saucer with the brush tool. To shade it like the example above, select the Brush tool and set the Fill modifier to a dark gray color. Set the brush mode to Paint Inside (Figure 1-6).



Figure 1-6: Brush modes and an example of each.

Start with the brush entirely inside the fill of the saucer and paint in the shading along the bottom. You can let the brush go past the edge of the shape because the Paint Inside modifier prevents the color from going outside the lines. Change the color to white and the size of the brush to a small tip. Then paint the highlight on the upper right side of the saucer.

To prevent further segmenting, group the entire flying saucer by selecting Group in the Modify menu. Grouped objects display a box around them when selected.

You can use segmenting to help you draw a crescent moon:

- With the Oval tool, draw a yellow circle on the Stage, away from the saucer. To draw a filled shape with no stroke, set the Stroke modifier to None (the topmost square in the color palette -- it looks white).
- Draw a different-colored circle overlapping the yellow one.
- Use the Arrow tool to select the second circle, and press Delete.
- Select the entire moon shape, and group it to prevent other objects from segmenting it further.

Grouping objects prevents them from being segmented by other objects, but also prevents them from being edited. To change any color in your saucer, you have to "get inside" the group. Do this by double-clicking the saucer. Notice that the moon now looks very pale. Also notice the Group icon at the top-left corner of the document window (Figure 1-7).

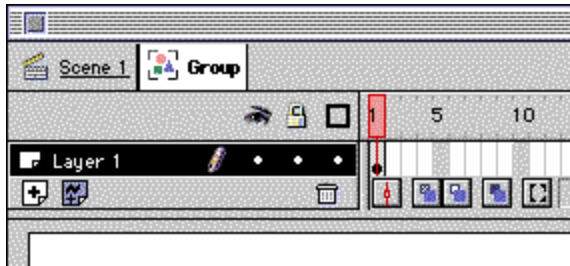


Figure 1-7: The icon for Group editing mode.

When you see this icon, it means you are inside a group and can edit its member objects (unless they, too, are subgrouped). Dimmed artwork is outside the group and cannot be edited or selected. Since the canopy was grouped before the entire flying saucer was, you cannot edit it. Double-click the canopy to get inside that group.

Nested Groups

The canopy group is nested inside the flying saucer group (much as you can nest a folder inside another folder on your computer's hard drive). To paint the highlight on the canopy, double-click the saucer, to get inside the saucer group, and then double-click the canopy, to get inside the canopy group. The upper-left corner of the document window displays this nested arrangement (Figure 1-8).

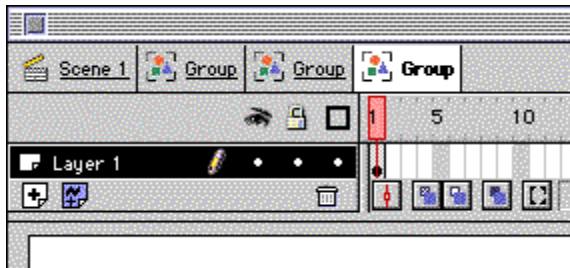


Figure 1-8: The Nested Group icon.

To get out of groups a level at a time, double-click the Stage to exit the canopy group, then double-click again to exit the flying saucer group. To get out of all groups at once, click on the words "Scene 1" in the upper-left corner.

Think of groups in Flash as protective plastic sleeves on CDs. You can double-group or triple-group objects (just like you can double- or triple-sleeve valuable CDs for greater protection):

- Be sure that you are in Scene 1 rather than your saucer, canopy, or moon group (click the words "Scene 1" at the upper-left corner of the document window).
- Select the moon (it was grouped previously, so it displays a selection rectangle around it).
- Choose Modify > Group.
- Choose Modify > Group again.
- The moon is now triple-grouped. To change its color, you would have to double-click it three times before you could edit it. (There is no functional reason for triple-grouping a single object; but knowing it's possible may help you diagnose problems in the future, as beginners tend to multiple-group things without realizing it.)

Save your file. You will use your saucer illustration in Lesson 2.

The Object and Transform Inspectors (Macromedia calls palettes *inspectors*) allow you to size and position elements on the Stage. Both can be found on the Inspectors submenu of the Window menu.

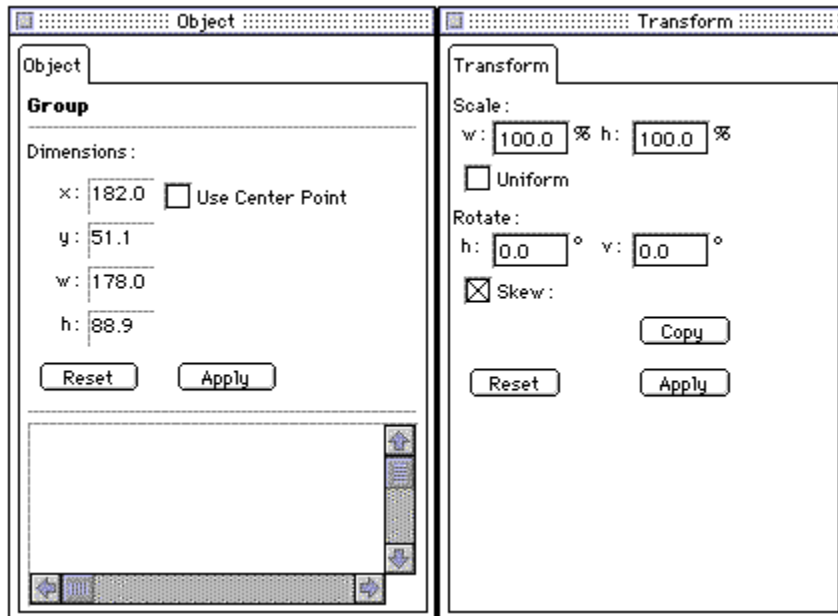


Figure 1-9: The Object and Transform inspectors.

To precisely position an object on the page, use the Object Inspector to enter the X and Y coordinates in pixels. You can also precisely size an object. Select the moon you drew and enter 50 for the X coordinate, 60 for the Y coordinate, and 72 for both the width (W) and height (H) on the Object Inspector (you can use the Tab key to move from field to field in the Inspectors).

To rotate the moon, select it, and open the Transform Inspector (Window > Inspector > Transform). Enter a rotation of -20° (negative numbers rotate objects counterclockwise).

Freehand Transformations

When you don't need precision, you can scale and rotate using the modifiers of the Arrow tool. Select the flying saucer, then click on the Scale modifier in the Toolbox (Figure 1-10).



Figure 1-10: The Rotate modifier (circled in blue) and Scale modifier (in red).

Drag a corner handle to scale proportionally, or a side handle to scale one dimension. To reflect an object, drag a side handle all the way across the object.

You can also scale and rotate using the Modify > Transform submenu.

Duplicating and Aligning Objects

If you wanted a whole fleet of small flying saucers, shrink the original and Option (Alt)-drag it to create a copy. Do this once more for a total of three saucers.

To align them horizontally, select all three saucers and choose Modify > Align.

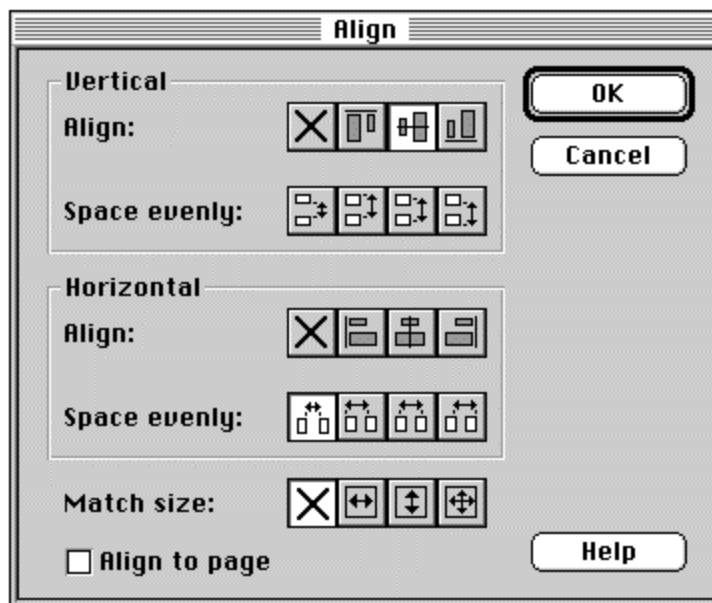


Figure 1-11: The Align dialog box.

The button icons in the Vertical section of the Align dialog box allow you to align objects on their upper edges, on their centers, or on their lower edges. Similarly, the Horizontal section gives choices to align objects on their left edges, on their centers, or on their right edges. When aligning objects that are the same size (like your saucers), it is unimportant which button you press in the Vertical section -- as long as it is not X, which prevents vertical movement.

If you want your saucers to be evenly spaced horizontally, in addition to being vertically aligned, press any button in the Horizontal Space Evenly row, and then press OK.

There are a few default gradients at the bottom of the color palette. You can create your own gradients by selecting the Color window button at the very top of the palette, or by choosing Window > Colors and selecting the Gradient tab at the top of that palette.

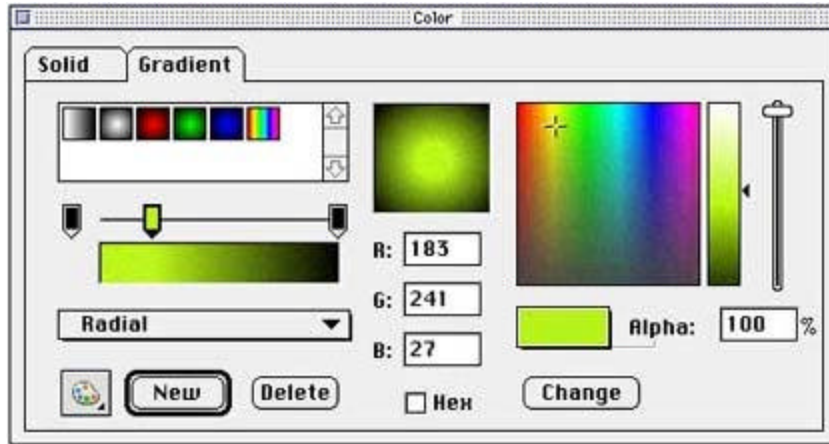


Figure 1-12: The Gradient tab in the Color window.

To create a gradient, select the type of gradient you want (Linear or Radial). Click on a color pointer at either end of the gradient definition bar, then pick from the Solid colors pop-up menu (just above the Change button) or the color space (the colored field above the Colors pop-up menu). Or you can type the RGB or hexadecimal value of the color you want. You can insert up to 14 additional color pointers by clicking between color pointers on the gradient definition bar. (For radial gradients, the color at the left end of the bar represents the center of the gradient.)

Changing the Gradient Position in Objects

Let's say you are going to create a night sky with the glow of the sunset on the horizon such as the one below:



- Select the Rectangle tool.
- In the Fill modifier, select the Color window button at the top of the color palette.
- Click the Gradient tab of the Color window.
- Make sure that the gradient type is set to Linear and select the left color pointer on the gradient definition bar.
- From the Solid color pop-up menu (just above the Change button), select a bright orange.
- Leave the rightmost color pointer set to black and click in the color bar between the orange and black color pointers to add a third pointer.
- Move the middle color pointer closer to the orange end of the bar.
- Select a dark blue from the pop-up list of colors.
- Press the New button to add this custom gradient to the list of gradients above. (It will now appear with the others at the bottom of the color palette for this document).

- Close the Color window.
- Draw a rectangle large enough to cover the entire Stage (notice that the rectangle automatically is placed behind the grouped objects -- groups always appear in front of ungrouped objects).
- To orient the gradient so the orange end is at the bottom of the rectangle, select the Paintbucket tool and click the Transform Fill modifier (the lower-right button on the toolbox).
- Click the rectangle.
- Drag the circle at the upper-right corner of the rectangle counterclockwise 90° (you'll have to guess -- Flash offers no way to create exact Fill transformations).

Since your rectangle is wider than it is tall, you lose the orange glow by rotating the fill 90°. Drag the square that is now centered above the Stage downward to the top edge of the Stage to compress the gradient to fit within the rectangle. (You could also move the center point of the gradient to reposition the entire fill.)

While Flash has many precision features, major limitations include:

- The absence of Bézier handles for complete control over curves
- The inability to wrap text to a path
- The inability to miter corners or square off ends of strokes
- The inability to precisely control gradients or do shading other than linear or radial fills
- The absence of advanced typographic controls

These limitations means you will find yourself returning to conventional drawing programs when you need to create really complex or precise artwork, such as a logo or diagram.

To get artwork or photos into Flash, choose File > Import and locate the desired image.

Importing Photography

Photographic images take more memory to render because they are raster-based. For that reason, you should make every effort to limit their use in Flash projects. You can convert photos into vector format (losing quality and realism to some extent) by selecting an imported photo, and choosing Modify > Trace Bitmap. The settings you use to trace will depend on the photo and the quality of the final output you desire. Color Threshold is the most significant option: the image quality improves as the threshold is set lower, but the number of vectors -- and therefore the file size -- increases (see Figure 1-13).

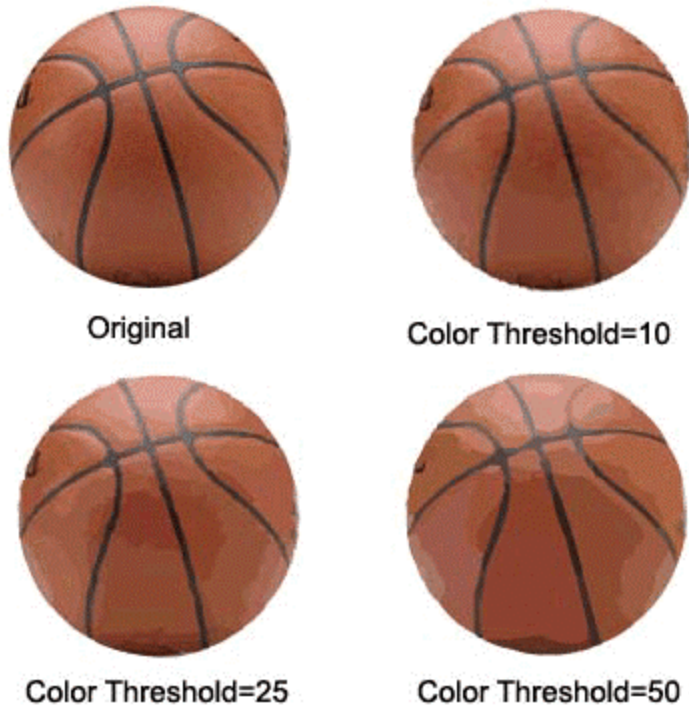


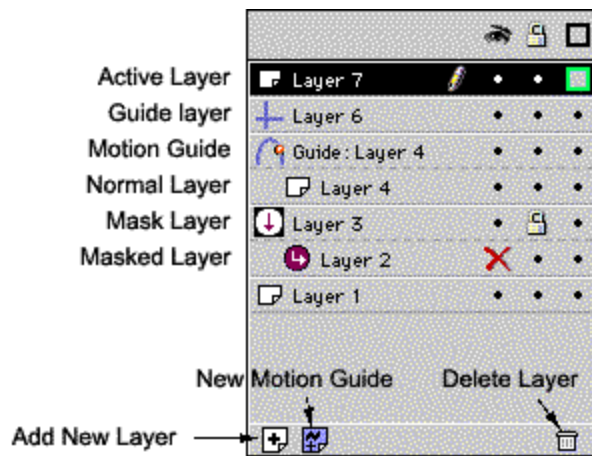
Figure 1-13: Color Threshold variations with the Trace Bitmap command; quality improves as the Threshold decreases.

Importing Vector Artwork

Vector artwork can be imported from native Freehand or Illustrator files. (Illustrator 8 files are problematic and should be saved as version 5, 6, or 7 files before importing.) The grouping and layering structure in the native application file is preserved in Flash.

Imported photos and vector artwork might need to be "broken apart," a process that eliminates any group structure and acts on photos like Trace Bitmap (without the control options). Select **Modify > Break Apart** to edit your imported artwork in Flash.

Layers are integral to maintaining control over the elements in a Flash movie. Layers appear to the left of the Timeline at the top of the document window (Figure 1-14).



Objects drawn on higher layers will overlap objects on lower layers. Layers can be dragged up or down in the Timeline, changing the stacking order of their contents. Layers can be hidden, locked, or viewed in Outline mode (showing only the outlines of the layer's contents) by clicking the dot under the corresponding icon.

Figure 1-14: The Layers section of the Timeline.

To Add Stars to Your Illustration:

1. Add a new layer to your file by clicking the white icon at the bottom left of the Layers section of the Timeline.
2. Rename the new layer Stars by double-clicking the layer name.
3. Use the Brush tool to draw some blue stars on the Stars layer (make some overlap the moon and flying saucer). If you drag the Stars layer under Layer 1, you won't see the stars at all, because they will be behind everything on Layer 1 -- including the sky-colored gradient. To move an object from one layer to another, select the object (the sky, in this case), and choose Edit>Cut. Create a new layer named Sky. Choose Edit>Paste in Place (this puts the sky-colored gradient in exactly the same position, but on the selected layer). Move the Sky layer to the bottom-most position.
4. Drag the Stars layer between Layer 1 and the Sky layer (notice that the formerly overlapping stars are now behind the moon and saucer).
5. To hide the Stars layer, click the dot adjacent to it, under the eyeball icon. Show it again by clicking in the same spot.
6. View the Stars layer in Outline mode by clicking under the square icon, adjacent to the Stars layer.
7. Lock the Stars layer by clicking under the padlock adjacent to the Stars layer.
8. To delete the Stars layer, click it once to select it, and then click the trashcan below the lowest layer. (You don't have to delete the stars if you like them!)

Mask Layers

Masks are layers containing filled shapes that set the visible area of underlying layer(s). To draw the planet Jupiter, you could use a mask to show a circular portion of some multicolored stripes:

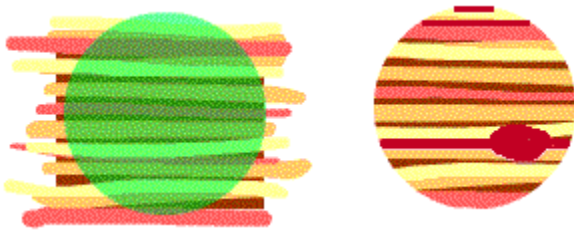


Figure 1-15: Using a mask to draw Jupiter.

1. Add a new layer called Stripes by clicking the New Layer icon below the lowest layer.
2. Use the Brush tool to draw stripes like those in Figure 1-15.
3. Add a new layer called Jupiter Mask.
4. On the Jupiter Mask layer, draw a circle that does not extend beyond the stripes (the color is unimportant).
5. Select the Jupiter Mask layer by clicking once on the icon next to its name, then CTRL-click on the Jupiter Mask layer icon; choose Mask from the pop-up menu.

Mask layers ignore any stroke painted on them. Also, mask layers AND the layers they mask must be locked for the underlying layer(s) to display the results of the mask. To do any editing of the mask shape or the artwork that is being masked, you must unlock the appropriate layer(s).

To Add a Great Red Spot to Jupiter:

1. Unlock the Stripes layer by clicking the adjacent padlock icon.
2. Select the Brush tool and set the Color modifier to red.
3. Paint an oval on one of the colored stripes.
4. Re-lock the Stripes layer to re-establish the mask effect.

The most important reason for using layers is that it is required for animating, which will be covered in the next lesson.

Animating with Flash

Lesson 2

Flash movies play at 12 frames per second (fps) by default. This is the rate at which most modems can download the movie fast enough not to cause delays in streaming. You may set your movie to play faster (more fps) or slower (fewer fps), but you cannot have different parts of a movie play at different rates.

If, for instance, if you want to animate a seedling growing into an oak tree in the space of 30 seconds, you would make the animation span 360 frames (12 fps x 30 sec). To make the same animation last five minutes, you would stretch it out over 3,600 frames (12 fps x 300 sec). Both the frame rate and the duration are controlled with the Timeline.

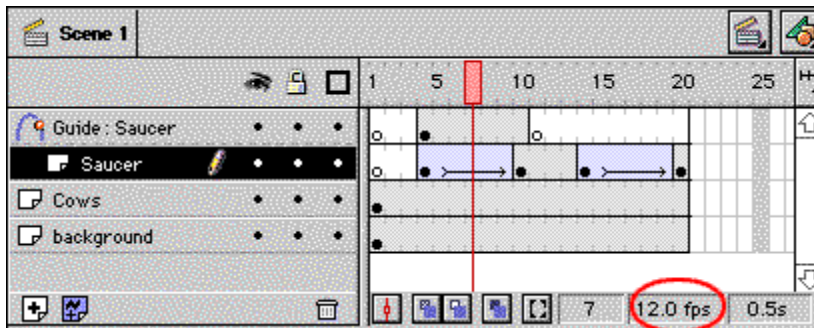


Figure 2-1: The Timeline.

The Timeline consists of a row of frames for each layer of the file. Above the frames are the frame numbers -- notice that only every fifth frame is numbered as well as shaded for clarity. At the bottom of the timeline is the movie's frame rate (circled in Figure 2-1). You may change this by double-clicking it.

A given frame may have any number of layers -- it all depends upon the construction of the file. In this course, specific frames will be referred to by both the frame number and the layer (e.g., "frame 10 of the Saucer layer"), much like the game Battleship, in which a specific location is referred to by both the row letter and column number.

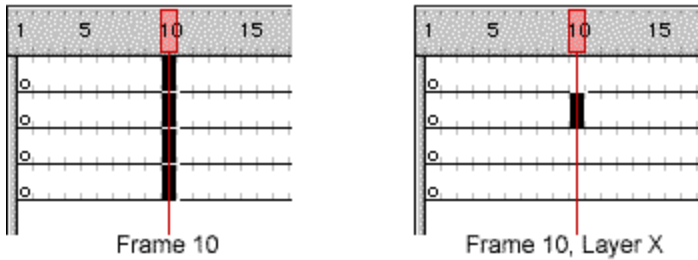


Figure 2-2: A frame (left) and a layer within that frame (right).

Keyframes

A keyframe is a frame where something on the stage changes, appears, or disappears. Keyframes are indicated in the Timeline with a white or a black circle. White circles indicate a blank keyframe (one with nothing on the Stage at that particular frame), and black circles indicate a keyframe with content.

To create a happy face that suddenly frowns, you would need at least two keyframes: one that contains the face smiling and one that contains the same face frowning.

1. In a new Flash file, rename Layer 1 "Face" by double-clicking the layer name.
2. Add a new layer named "Features" by clicking the New Layer button (the button below the layers with the "+" on it).
3. Drag the features layer above the Face layer so the features you draw on it will appear in front of the face shape.
4. Click on Frame 1 of the Face layer. (It will turn black to indicate it is selected.)
5. Use the Oval tool to draw a yellow circle in the middle of the stage. (Notice after you have drawn the circle, there is a solid black circle in Frame 1 of the Face layer, indicating something is in that frame.)
6. Select Frame 1 of the Features layer and draw two black ovals for eyes. Use the Pencil tool to draw a smile on top of the yellow circle. (The Pencil tool has two modes, Smooth and Straighten; you'll want to have the Smooth modifier selected to draw the smile.) Notice that both layers now have a black circle in Frame 1.
7. Select Frame 10 of the Face layer. Choose Insert > Frame. This adds nine more frames, but only Frame 1 is a keyframe, as that's where the yellow circle first appears. No other frame on this layer will be a keyframe, as the yellow circle will never change in the animation.
8. Select Frame 10 of the Features layer. Choose Insert > Keyframe. This also adds nine frames to the layer, but it duplicates the contents of the previous keyframe into Frame 10, whereas simply adding the regular frame in the previous step did not.
9. With Keyframe 10 of the Features layer selected (it should appear black in the Timeline), deselect the face (click on a white part of the Stage).
10. Use the Arrow tool to bend the smile into a frown.
11. Press Return or Enter to preview the animation. For the first nine frames the face is smiling. It abruptly frowns in the last frame because that is the one in which you made the change.

12. To make the smile last longer, click Frame 5 of either layer, Shift-click Frame 5 of the other layer, and choose Insert > Frame.
13. Use the Insert Frame keyboard shortcut (F5) to add nine more frames to each layer. (The keyboard shortcut is the easiest method to add regular frames to an animation and will be used throughout this course.)
14. Press Return to preview the results (the face takes twice as long to frown, but frowns just as suddenly).

Frames 2-19 of the above animation may look empty in the Timeline, but they are not. A gray frame contains whatever was in the preceding keyframe. The truly empty frames are those beyond Frame 20, which still appear to have thin gray divider lines, and the gray frames marking every fifth frame.)

In olden days (10 to 15 years ago), animation studios like Disney and Warner Brothers had legions of artists draw each and every frame of a feature cartoon. The experienced artists would draw the keyframes (e.g., a picture of Bambi stepping onto a frozen pond, one of him struggling to stay upright, and a third one of Bambi sprawled on the ice). The apprentice artists would be given these keyframes and instructions to draw X number of in-between frames (motion pictures being 30 fps, these "in-between" artists had their week planned). The term *tweening* comes from this process and refers to the generation of the in-between states of two images. If you give Flash starting and ending keyframes, Flash can do the tweening for you.

Shape Tweening

Shape tweening (also referred to as morphing) is when one shape changes into another. You will use shape tweening to gradually change your smiley face from the previous exercise into a frown:

1. On the Features layer, double-click any frame between 1 and 20.
2. In the Frame Properties dialog box (Figure 2-3), pick the Tweening tab at the top.

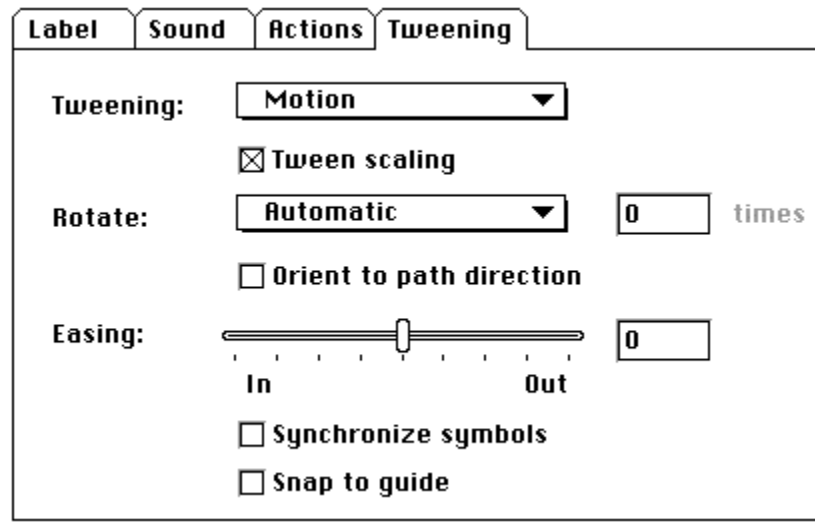


Figure 2-3: Tweening options in the Frame Properties dialog box.

3. Set the Tweening option to Shape and click OK.
4. Press Return to preview the animation.

A shape tween is indicated on the Timeline as an arrow on a green background (if you see a dashed line, it indicates something is wrong with the tween; be sure you specified Shape Tween rather than Motion Tween in the Frame Properties dialog box by repeating Steps 1-3 above). Because you actually have three shapes on the same layer, it is possible that Flash confused which shape should turn into the frown, and you may get very bizarre results:

Shape Hints

If Flash does confuse the starting and ending positions of shapes being tweened, you can use Shape Hints to map the right eye in Frame 1 to the right eye in Frame 20.

Follow these steps:

1. Select Frame 1 of the Features layer.
2. Choose Modify > Transform > Add Shape Hint. This drops a marker labeled A in the middle of the Stage.
3. Drag shape hint A and place it at the bottom of the right eye (it will snap to the edge).
4. Choose Modify > Transform > Add Shape Hint again. This will place a marker labeled B on the stage.
5. Drag shape hint B to one end of the mouth.
6. Select Frame 20. There the corresponding shape hints are still in the center of the stage (B is on top of A). Drag B to the same end of the mouth and place A at the same location at the bottom edge of the right eye (the left eye needs no shape hint, as it is the only other shape on the layer).
7. Press Return to preview the animation.

You can have up to 26 shape hints in a single tween. They will not show in the finished movie, but if you find them distracting, you can hide them by choosing View > Hide Shape Hints).

Motion Tweening

A less memory-intensive method of tweening is the motion tween. This is where the size, color, orientation, or position of an object changes over time. You will motion tween the flying saucer from Lesson 1 to make it appear to fly in from outer space:

1. Create a new Flash movie.
2. Change the color of the Stage to dark blue by choosing Modify > Movie and selecting a very dark blue for the background color. Press OK.
3. Open the file you saved from Lesson 1 and drag the flying saucer to the new file.
4. Close the old file.
5. Position the saucer in the middle of the Stage.
6. Add a keyframe at Frame 20. (Throughout this course, you'll be instructed to add frames on frame numbers divisible by five, but that is for your convenience only; these can be added at any frame in the Timeline.)
7. Select Frame 1 and move the saucer to the top-right corner of the canvas.
8. Select any frame between 1 and 20 and choose Insert > Create Motion Tween.
9. Press Return to preview the movement.

10. Open the Transform Inspector (Window > Inspectors > Transform), and set the uniform scale of the Frame 1 saucer to 5 percent. Press Return to preview the results.

Motion Guides

Just as shape hints help Flash during shape tweening, motion guides help during motion tweening. You can make the flying saucer zig back and forth in its approach by adding a motion guide layer:

1. Click the blue Add Motion Guide icon next to the New Layer icon.
2. Turn on Onion Skin Outlines by pressing the third icon at the bottom left of the Timeline (it's a blue square overlapping a white square). Onion-skinning allows you to see where objects are in other frames.
3. Spread the Onion Skin Markers along the Timeline numbers to encompass all 20 frames (Figure 2-4). This allows you to see the outlines of all frame contents.

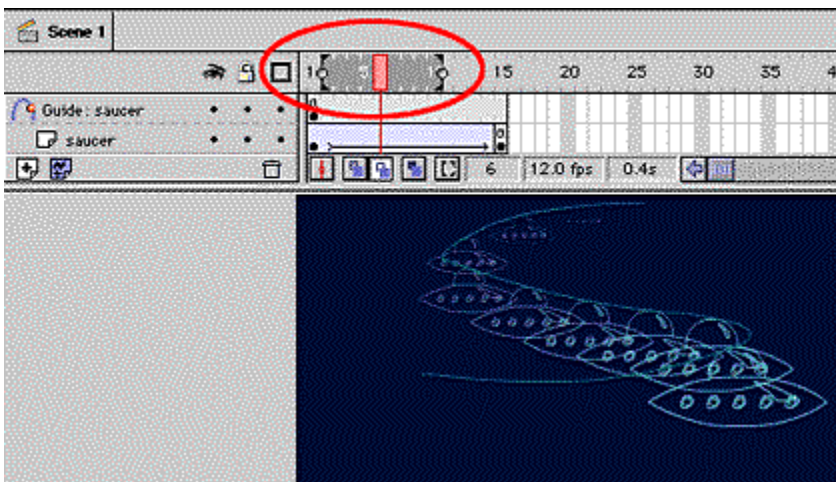


Figure 2-4: Onion Skin Markers

4. Make sure you're on the new Motion Guide layer and use the Pencil (with Smooth modifier) to draw a line from the *center* of the smallest saucer to the *center* of the largest. If the outlines of the saucer don't immediately wrap to the shape of the motion guide, you missed one or both centers by more than a few pixels. Use the Arrow tool to nudge one or both ends of the line closer to the center of the smallest/largest saucer (magnifying them with the Zoom tool will help).
5. Because you don't want the curved motion guide to be visible in the finished movie, hide the Motion Guide layer by clicking under its eyeball in the Layer palette.
6. Press Return to preview the results.

Frame-By-Frame Animation

If you are a real glutton for tedium, you can animate the old-fashioned way by changing the artwork on each successive frame. Frame-by-frame animation is more memory-intensive because it requires unique artwork on every frame, rather than referencing only changes in size, shape, or position at certain keyframes. The fewer occurrences of major artwork in a Flash movie, the smaller the file will be and the faster it will download. The next lesson shows you how to use symbols to further streamline your movies.

Using Symbols, Instances, and Sounds

Lesson 3

In the previous lessons, everything you drew was a unique piece of artwork. Every frame containing the saucer took the same amount of memory to render.

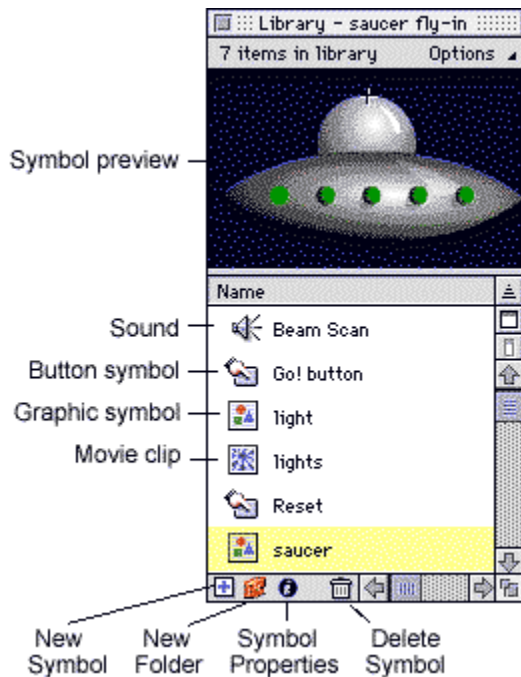
You can dramatically streamline a Flash file by using symbols instead of unique artwork. A symbol can be used any number of times in the Flash movie while barely increasing the file size. You'll find that almost everything in a Flash movie should be defined as a symbol.

Kinds of Symbols

Symbols come in three flavors: graphics, buttons, and movie clips.

The Graphic Symbol

Graphics are nothing new -- you've been creating them since Lesson 1. To create the animation you'll need a flying saucer. You've already drawn one in the file you created in Lesson 1 and used it again in Lesson 2. Start a new 550 x 400 pixel file with a dark blue background. (Set the background color by choosing Modify > Movie). To put the saucer in this new file, open either the Lesson 1 or the Lesson 2 file and drag the flying saucer graphic to the center of your new file. Because you will use the saucer throughout the rest of the lessons, turn it into a symbol by selecting it (in the new file) and choosing Insert > Convert to Symbol. Symbols are stored in the Library (Window > Library).



Now recreate the motion tween and motion guide of the saucer, (using the same procedure you did in Lesson 2). Make the animation cover 15 frames, and make sure the saucer ends its motion tween in the center of your stage. Remember to hide the Motion Guide layer so it does not display in the final animation.

Figure 3-1: The Library contains all symbols and imported artwork of a Flash file.

The movie clip Symbol

1. Choose Window > Library if the Library is not already open. Click the New Symbol icon (the blue "+") at the bottom of the Library palette.
2. Name the new symbol "lights" and choose Movie Clip as its behavior.
3. Notice that now your stage does not have a fixed size, and the top left corner of the document window appears as if you are working inside a group. This is Symbol Editing Mode. Draw a green circle on the centerpoint, and duplicate it four times to create a row of five dull green circles. (Use Modify > Align to distribute them evenly.)
4. Add four more keyframes to the Timeline in Frames 2-5.
5. In Frame 1, change the color of the first circle to a bright neon green.
6. In Frame 2, change the color of the second circle to a bright neon green.
7. Repeat for the remainder of the keyframes, changing the successive circles to a neon green color. (This is frame-by-frame animation.)
8. Preview the symbol by pressing Return. Make sure that only one circle "lights up" per frame.
9. Double-click the Saucer symbol in the Library to edit it.
10. Place an instance of the lights movie clip on the body of the saucer. Return to scene 1. The Lights symbol is now embedded within the Saucer symbol.
11. Choose Control > Test Movie.

A particular occurrence of a symbol in the movie (or nested inside another symbol) is called an instance. Instances can be transformed like other artwork, without affecting the master symbol in the Library. They can also have a variety of color effects applied to them (such as transparency), which you cannot do to unique artwork. If you decide you prefer blue lights on the saucer, you do not have to edit the five frames of the Lights movie -- just apply a color effect on the lights instance within the Saucer symbol:

1. Double-click the Saucer symbol in the Library.
2. Select the instance of the Lights symbol on the body of the saucer. Choose Modify > Instance and click the Color Effects tab.
3. Select Special from the Effect menu.
4. Slide the rightmost Blue slider all the way to the right to increase the color transparency of blue.

FLA versus .SWF

When you create an animation, you are working in a Flash document (with file extension .fla). This is not to be confused with the Shockwave/Flash file that will actually be viewed online (.swf). The difference is analogous to working in a layered Photoshop file (.psd) versus flattening the file and saving it as a JPEG (.jpg). All the layers, imported artwork, sounds, and unused symbols are contained within the .fla file, which is larger and cannot be used by anything other than Flash. The .swf file is much smaller, and contains only the images and sounds actually appearing in the movie. If you decide to edit the movie, open the .fla file to make the change, and republish the .swf file (more on this in Lesson 6).

Buttons

Buttons are needed whenever the user is expected to control something. Buttons are animations with a maximum of four frames:

- Normal: This is how the button looks as soon as it appears onstage.
- Over: This is how the button looks when the user places the mouse cursor on it
- Down: This is how the button looks when the user clicks on it.
- Hit: This frame defines the "hot" area of the button; it does not ever display. If, for instance, you made a button shaped like a spider but wanted the rollover effect to only occur when the user moused over the abdomen, rather than all the legs, you would create an abdomen-sized shape in the "hit" frame of the button animation.

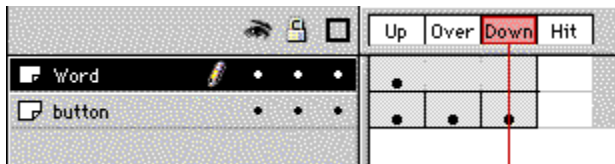


Figure 3-2: The timeline of a button symbol.

To create a typical rectangular gray button, open the Library and press the New Symbol icon (+) at the bottom.

1. Name the symbol "Restart Button" and choose Button for behavior.
2. Draw a gray rectangle on the centerpoint
3. Create the beveled edge by using the Arrow tool to marquee the top side of the rectangle and filling it with a lighter gray. Do the same for the left side.
4. Create bevels on the bottom and right sides the same way, using a darker gray.
5. Add a layer and type the word "RESET" on the new layer.
6. Add a keyframe to the Over frame of Layer 1. Change the color of the gray rectangle to yellow (using light yellow for the top-left edges, and dark yellow for the bottom-right edges).
7. Add a keyframe to the Down frame of Layer 1 and rotate the entire button (but not the word) 180° using the Rotate modifier on the Toolbox, the Transform Inspector, or the Modify > Transform > Rotate command. (This reverses the highlight and shadow edges to make it look depressed rather than embossed when the user clicks it.)
8. Do not add anything to the Hit frame -- the shape of the button in the previous frames determines where the user may strike it.
9. Return to Scene 1 and place an instance of the Reset Button onstage in the last frame.
10. Choose Control > Enable buttons and try out your new button. (Remember to disable buttons when you are satisfied that they work; you cannot select a button when it is enabled.)

To make buttons function, you'll assign ActionScripts to them later.

Sounds

Sounds add a whole dimension to the user's experience. Sound files can be added to any frame in the main timeline, or the timeline of a symbol (such as setting the Down frame of a button so when the user presses, it clicks).

Only .aiff sound files can be imported into Flash on a Macintosh, and only .wav sound files can be imported into Flash on a PC.

Flash comes with a default sound library that contains many interface element sounds. Open this by choosing Libraries > Sounds. To add a sound to the button you created in the test button file, open that file and double-click the Restart Button symbol in the Library. (Notice the Library palette looks just like the Sounds Library. Don't confuse them; you can add to your file's Library, but not to the Sounds Library.)

1. In Symbol Editing Mode for the Restart Button symbol, select the Down frame.
2. Drag an instance of the Industrial Door Switch from the Sounds Library to anywhere on the stage (you can't see sound, so it does not matter where you drop it).
3. Notice the Down frame in the button Timeline has a sound wave form icon in it. Double-click the frame to open the Frame Properties Dialog box (Fig. 3-5).

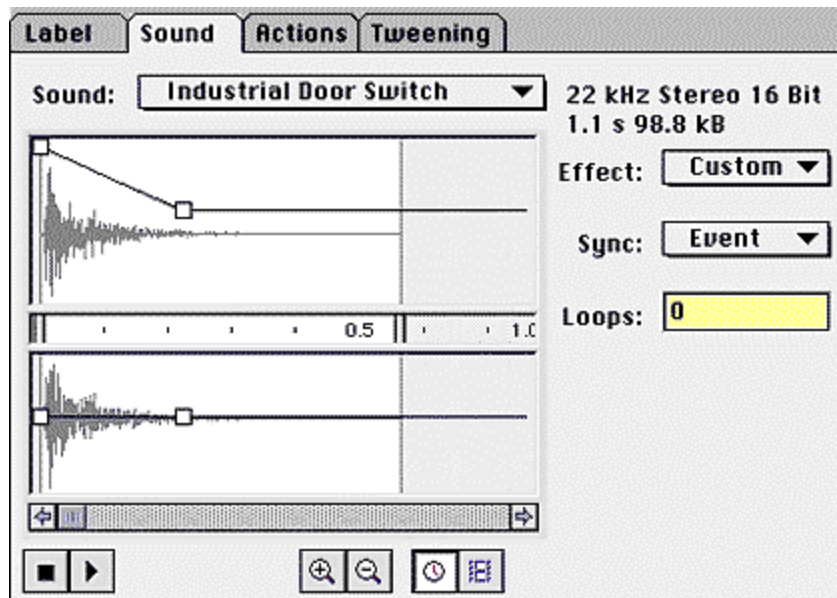


Figure 3-3: The Sound tab of the Frame Properties dialog box.

The Industrial Door Switch sound is in stereo, hence the two channels. The upper wave form is the left channel; the lower is the right channel. Between the two channels is the sound timeline with In- and Out-control points (they determine how far into the sound file it becomes audible, and where it stops). The lines above each wave form are called Envelope lines; they set the volume in each channel (when an Envelope Handle is high, the volume is loud; when one is low, the volume is reduced).

To the right of the channels are three sound options:

- **Effect:** applies a preset Envelope effect you can modify using the Envelope Handles
- **Sync:** determines if the specified sound should start, stop, stream, or play as soon as possible in its entirety (Event)

- **Loop:** the number of times the sound should play consecutively (for continuous sound, use a very high number)

The default options are best for using a short sound effect such as the Industrial Door Switch. Click OK.

Return to Scene 1, enable buttons (CONTROL > Enable Buttons) and click your Reset Button. To add a sound to the flying saucer as it flies in, select Frame 1 of Layer 1 (where the saucer first appears), and drag an instance of the Beam Scan sound to the stage. Double-click Frame 1 of Layer 1 to open the Sound tab of the Frame Properties dialog box, and set the effect to fade in. Click OK, and preview the movie.

Custom Libraries

You can add your own library to the Libraries menu by creating a Flash file with the symbols you want to appear in the custom library and placing the file in the Libraries folder inside the Flash Application folder.

Using ActionScripts

What Are Actions?

Actions are commands that are assigned to buttons or to frames. Such commands can be very simple (such as the Stop action that halts the playback of the movie), or they can be combined into very complex ActionScripts (multiple actions) that evaluate conditions and perform accordingly.

ActionScripts are a kind of programming language; if you have ever used JavaScript or Visual Basic, you will recognize many of the actions in Flash. However, you do not need any programming experience to create ActionScripts.

Assigning a Frame Action

Use the Saucer.fla file you created. Since movies loop by default, this one plays over and over when tested. To keep a movie from looping, use an action that stops it when it reaches the last frame:

1. Add a layer called Actions
2. Insert a blank keyframe in the last frame of the movie on the Actions layer
3. Double-click the blank keyframe you just added to open the Frame Properties dialog box
4. Click the Actions tab
5. Use the "+" dropdown menu to add the Stop action
6. Click OK
7. Press Command-Return (Mac) or Control-Return (Windows) to test the movie

Assigning a Button Action:

To make the Reset button in your saucer movie restart the movie:

1. Select the Reset button in Frame 1
2. Choose Modify > Instance and click the Actions tab

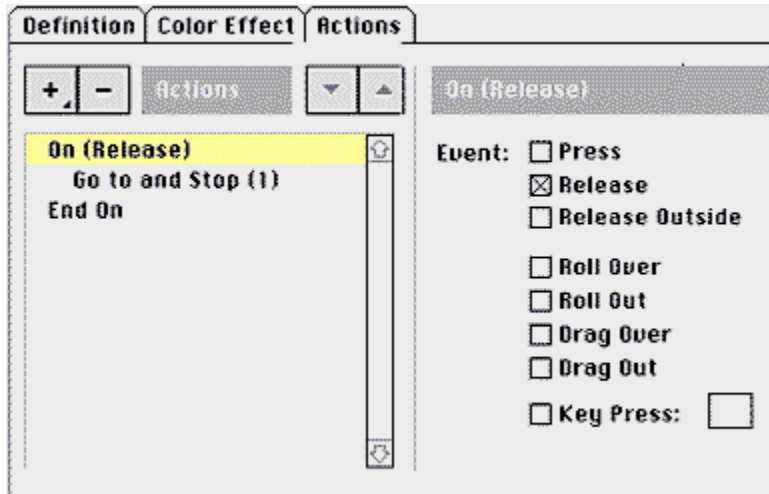


Figure 4-1: Create ActionScripts in the Actions tab of the Instance Properties dialog box.

3. Use the "+" dropdown menu to add the On MouseEvent action. (This means the action will begin when the user does something with the mouse.) This is how all Actions attached to buttons begin.
4. Most actions have specific parameters that must be set. These appear in the right half of the dialog box. In the case of On MouseEvent, the parameter is which exact mouse operation triggers the action: pressing, releasing, dragging, etc. Choose the Release checkbox. (This is the most common way a button operates -- it does nothing until the user releases the mouse button after pressing it.) Notice the Action in the left half of the dialog box inserts the proper syntax and punctuation once you select the Release parameter.
5. From the "+" menu, select the GoTo action.
6. In the Parameter side of the dialog box, leave the Frame option set on 1 and check the Go to and Play box at the bottom.
7. Click OK.

This ActionScript tells the button that when it is released, the movie will immediately go to Frame 1 and begin playing. (The GoTo command -- for reasons only a programmer could fathom -- defaults to Go To and Stop, which is usually not what you want!) When the movie reaches the last frame, that frame action tells it to stop, rather than loop back to Frame 1, as it would do by default.