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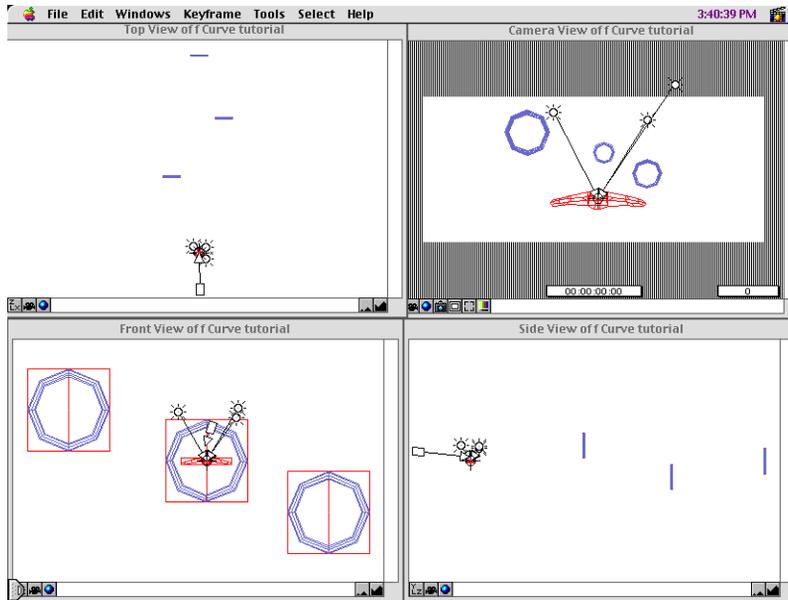
# F-Curve Tutorial

Welcome to the new method of animating in version 2.8 of ElectricImage. Function Curves will change the way that you look at animating. If you're either new to animation in EI altogether, or a seasoned ElectricImage veteran, you will be able to pick up the concept behind function curves in just a few short lessons. The key to learning how function curves work, and how to make function curves work for you, is to completely forget everything that you've picked up in previous version of ElectricImage or other less powerful applications. So here we go.

## Project Overview

First let's have a quick overview of the project file. It's a good idea to have this document and the ElectricImage project named F Curve Tutorial open at the same time. This document is assuming that you've already briefly covered and understand the ElectricImage program interface and have a basic understanding of how the program works.

The goal of this tutorial is to fly a spaceship through three rings. I've set up the project to reflect my usual working habits and these little tips will prove invaluable to you in your later work.



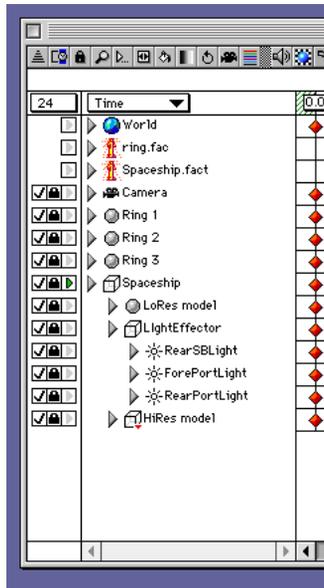
*Figure 1*

We're going to animate this lo-res version of a spaceship through the three rings. Once the animation is completed, we'll turn off the lo-res geometry and turn on the hi-res version.

You should spend a few minutes familiarizing yourself with the way that I've organized the model hierarchy before proceeding any further. Both the lo-res and hi-res version of the model are parented underneath an effector named Spaceship. In this case, we're only going to animate the effector rather than the geometry. By using this method, we can easily replace the geometry in the scene by simply deleting the current model, and then importing a new model and re-parenting it to the animated effector. The next trick is that we have another effector parented under the Spaceship effector. This effector has all of our light sources for the scene parented to it. I've set the effector NOT to inherit the rotational values of the parent in the Link control window. What we have done is created a light

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array which follows the model through the scene but does not inherit the model's rotational values. By using this method, we can easily set up our lighting and shadow buffer values with a minimum of work.



*Figure 2*

This is the model hierarchy for the animation. A lo-res and hi-res version of the model as well as a light array are parented to the top effector. The top effector is what we will animate.

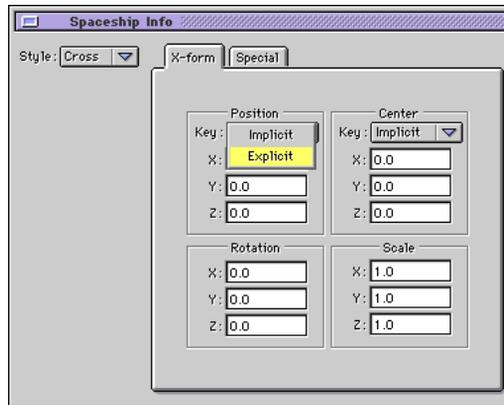
Now we're ready to start animating. But before we start, be sure to turn off the visibility of all of the objects in the scene except for the Spaceship effector, the lo-res version of the model, and the three rings. By keeping the visible objects to a minimum, and by using lo-res versions, we can increase our system response time tremendously.

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## Setting Up For An Animation

For those of you who have already skipped ahead and have not read my carefully written tutorial and have not been able to make things work, shame on you. For those of you who have stuck by me, you rock! The next step that we have to take is to turn on certain flags that lets the application know that you're going to be animating an object. We have to first turn on the animation flag in the Project Window. Refer back to Figure Two and notice that the green arrow next to the Spaceship effector is turned on, and that the rest of the objects parented to the effector have the green arrow turned off. You turn this flag on and off by simply clicking on the arrow with the mouse. What that flag shows is that only the Spaceship effector can be animated, the rest of the objects can not be keyframed. For those of you not familiar with EI, what this means is that you can move any objects that have the animation flag turned off at any time in the timeline without setting a keyframe. Any object that has the flag turned on will set a keyframe if moved.

The next step is to set the type of keyframe animation that we wish to use. In this case since we want to animate using F Curves we have to set the type of keyframe to Explicit. If we were to animate our scene using Implicit keyframes, it would use the older velocity curve model instead of the new F Curve model. The system automatically defaults to Implicit keyframes, so of course we have to change that setting. This is done by double clicking on the Spaceship effector in the Project Window or by pressing *command + I* while the Spaceship effector is selected, both methods bring up the Group Info window.



*Figure 3*

The Spaceship effector has to be set to Explicit rather than Implicit keyframes. This can be set in the Group Info window for the Spaceship effector.

In the Group Info window for the Spaceship effector, click on the pulldown menu under the Position header and select Explicit for the type of key. Ignore the set of variables to the right, for this tutorial we're not going to deal with them.

## The Function Curve Editor

If you have two monitors, then you're life is going to be substantially easier, if you don't, now is your chance to go spend some more money. Either go to the top menu titled Windows or press *command + `* on the keyboard. This will bring up the Function Curve Editor window. What I usually do is move this window to my second monitor, and position it right above the Project window. This way I can see all of the world views of the project at the same time as the animation keyframes.

The next step is going to be slightly more complicated so pay careful attention. What we

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have to do is add the function curves that we wish to animate into the Function Curve Editor window. Never mind the fact that some of you still don't know what a function curve is yet, we'll get to that in a second. In the Project window, click on the triangle in front of the Spaceship effector. It should rotate and expose a series of animation variables underneath titled: Visibility, X-Form, AutoFrames, and Bone. Click on the triangle next to the X-Form variable and that in turn should rotate and expose another set of variables titled: X Offset, Y Offset, Z Offset, and so on. We're only going to be interested in the first three variables for now anyway so ignore the rest. Next to the X, Y, and Z Offset variables the green animation flag should be turned on, while the arrow set on an angle next to the green flag should be dimmed to off.

The arrow when it is dimmed, indicates that the variable is using Explicit rather than Implicit keys. Now double click on each of the X, Y, and Z Offset variables in turn, and notice that each one of the variables now appears in the left hand side of the Function Curve Editor window. The next step is to scroll down a little in the Project window and set the Pitch, Yaw, and Roll variable flags to Explicit keys which as stated before is done by dimming the angled arrow next to the variable. Now double click on each of the variables in turn to add them to the Function Curve Editor Window.

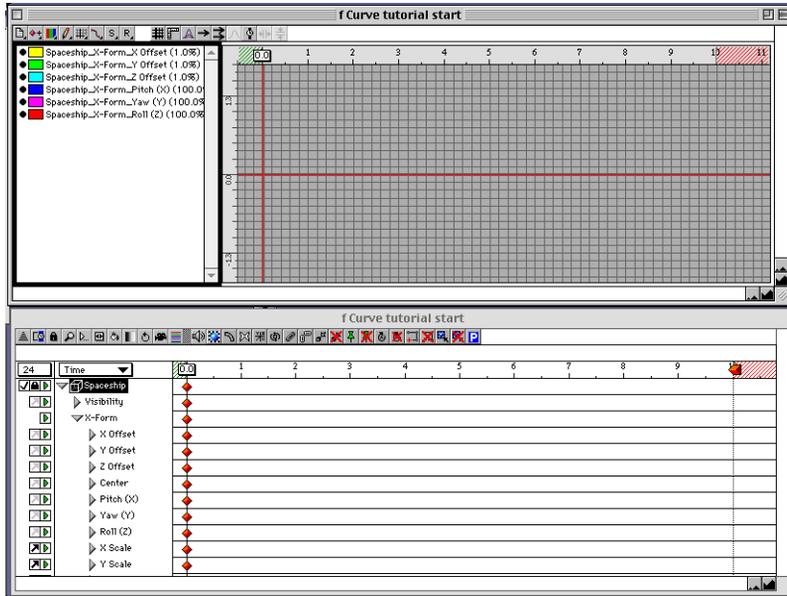


Figure 4

Function Curves are added to the Editor window by double clicking on the variable in the Project window. These variables are animatable by Explicit keyframes, indicated by the dimmed angled arrow flag in the Project Window. We're going to animate the X, Y, and Z positions as well as bank, pitch and roll of the Spaceship effector.

## What's a Function Curve?

OK I'm willing to bet that a lot of you really want to know what a function curve is right about now. I don't blame you. It might seem more complicated that it really is, so bear with me for a few minutes. The sooner that you understand the concept of function curves, the sooner you will become a master animator. If there's one time to really pay attention it is now.

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A function curve in the case of ElectricImage is a mathematical description, displayed in the form of a curve, of the animation of a value over time. This value can be scale or even rotation but it's easiest to visualize this concept when thinking in terms of spatial or X, Y, Z coordinates. Take a quick peek at the Function Curve Window. Along the top of the window or horizontal axis you can see the all too familiar time line, which in this universe, contrary to Gene Roddenberry, is linear. Along the left side of the window running vertically is a set a numbers, which is divided into positive and negative integers. The positive and negative integers are separated by a horizontal line denoting zero. All function curves are aligned to zero until they are animated.

If you were to animate an object for example, and you wanted it to move away from you along the -Z axis, the object would have an increasingly larger value for the -Z coordinate as time progressed. If you were to plot this value over time, it would look something like the following image.

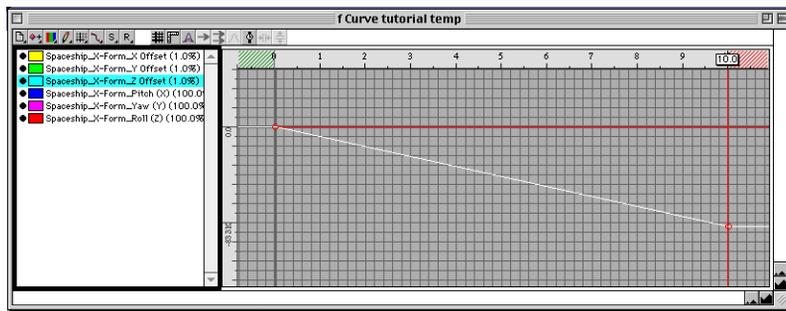


Figure 5

The value of a the -Z coordinate decreases over a period of ten seconds. The velocity of the model is constant, which can be determined by the linear slope of the curve.

The curve in Figure Five shows the translation of a model over a period of ten seconds and a distance close to -900,000 units in Z. The vertical value of each point on the line cor-

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responds to the -Z translation of the model. As any point on the line moves lower down on the curve, the -Z value is increased. As any point on the line is moved further to the right, it takes place later on in the animation. As the line moves lower, the value of -Z increases.

Now look closely at the slope of the curve, it's linear. What this means is that the velocity of the model is constant, since at each consecutive point along the timeline, the value of -Z is an even increment from the previous value. In this case, what the function curve is doing is plotting the -Z translation of the model over time.

Now let's change things around a little. Look at the following function curve.

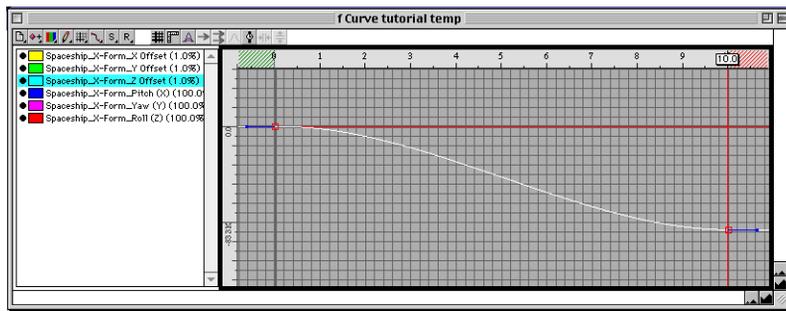


Figure 6

In this case, the slope of the curve is different from the preceding figure. The velocity of the model is now changed and in effect eases into and out of the animation.

By changing the slope of the curve in Figure Six, we change the movement of the model over time. In this case, the model will start moving slowly at the beginning of the animation, accelerate, and then slow down at the end of the animation. Once again keep in mind that a function curve plots the value of a variable over time. Examine the curve in Figure Six and notice that the -Z value of the model decreases or changes slowly over the first few

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seconds of the animation. This gradual or slow progression is indicated by the shallow slope of the curve. Near the middle of the animation, the -Z value changes rapidly, decreasing sharply over a shorter period of time relative to the beginning of the animation. This can be seen in the steeper slope of the curve in the center of the timeline. Near the end of the curve, it flattens out once again to a shallow slope with the -Z value changing more gradually. Do you get it yet? If not, read this section again till you do. Now it's time to animate.

## Animating With Function Curves

Now that you've made it this far, you'll be happy to know that it's all downhill from here. The only thing that you need to do now before starting to animate the spaceship is to play around in the F Curve Editor window a little to familiarize yourself with the interface. Many of your keyboard shortcuts such as panning with the spacebar and zooming in with the option key work. Play with the buttons on the top of the window which let you toggle on and off features such as acceleration, the snap functions, the grid and so on. Also on the right side and bottom of the window are separate zoom in/out controls with work on separate horizontal and vertical axis. You might want to do a quick perusal of the manual which describes each of the buttons in more detail. If you don't want to then that's cool, it's not going to make or break you for now. The one thing that you might want to know is that you can toggle on and off visibility of each curve by clicking on the dot next to the F Curve on the left side of the window.

Now let's get started. The first thing that we're going to do is to set a keyframe. What I've found is that it's easiest to create the macro or large parts of an animation first before concentrating on the micro. For this animation we want the spaceship to fly through the three rings. So you should do first is translate the model along the -Z axis. Set your timeline to ten seconds and then drag the model along the -Z axis until it is well past the last ring. Remember you're only animating the Spaceship effector! Your F Curve Editor Window should look like the following figure.

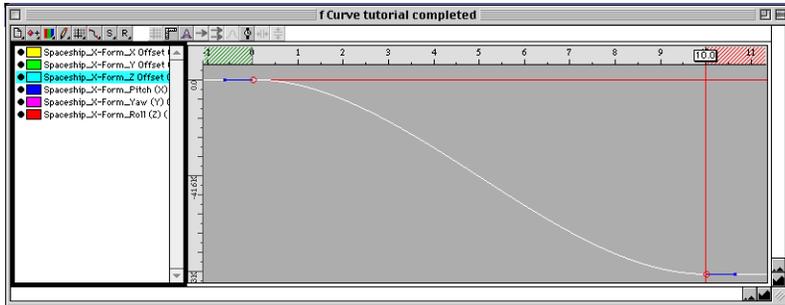


Figure 7

The first step in this animation is to translate the model along the -Z axis. Your function curve should look like this.

Now if you've read the preceding sections carefully you'll know that this is not quite what we want in terms of the slope of the curve. We want a linear curve so that the velocity of the model over the duration of the animation is constant. We can achieve this in two ways. The first way is to drag the control handles for the curve so that the curve becomes a straight slope. While this might seem like a good idea, there is a better way. Double-click on the Spaceship\_X-Form\_Z Offset variable on the left side of the Editor window. The Info window for the F Curve will pop up.

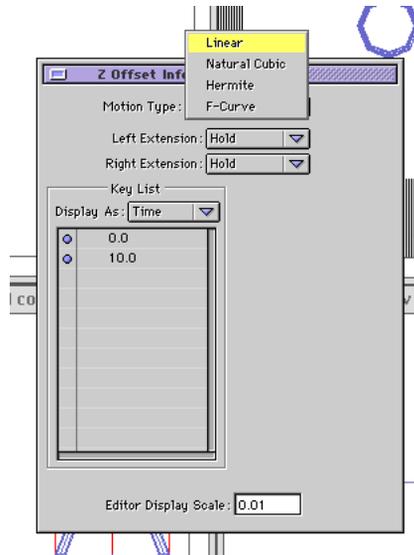


Figure 8

The Info window for the F Curves let you set the interpolation for the various types of Curves as well as a listing of the keyframes that have been set.

In the Motion Type pull down menu it should be set to F-Curve, change the selection to Linear. Notice that the slope of the curve immediately changes to a constant slope. There are other types of curvature interpolation, be sure to experiment, but do it later, we still have a lot of stuff to cover. Preview your animation if you wish.

Now our next step is to make the spaceship fly through the rings. In the top view window, scrub the timeline until the spaceship is right next to the first ring which should be at around frame 70. Now drag the spaceship along the -X axis until it passes through the first ring. Be sure not to move the model along the Y axis quite yet. Repeat this process for the remaining rings. Notice that the motion path for the Spaceship effector updates as you

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drag the effector. Select the X Offset function curve in the Editor window, it should look like the following Figure.

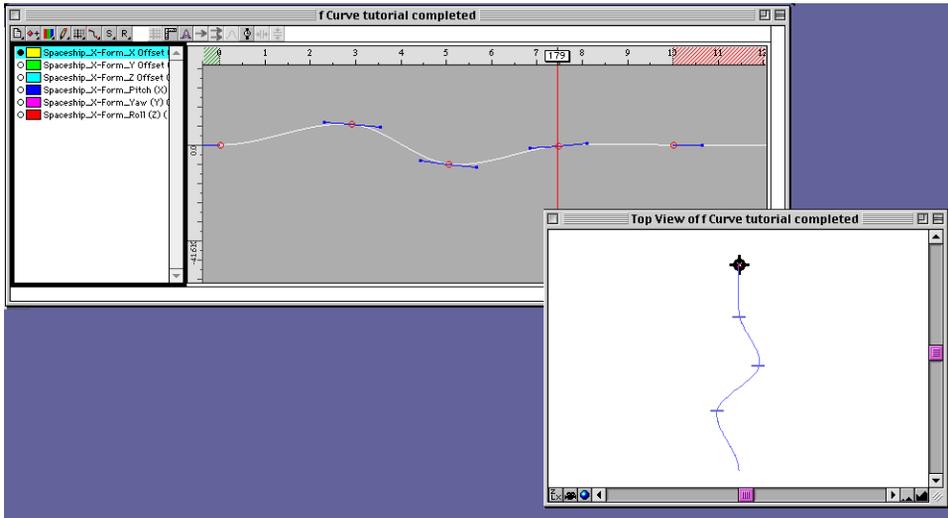


Figure 9

The F Curve for the X translation of the model looks a lot like the actual motion path of the model...

We're going to set our keyframes in a different manner for this next round. Look in the Front View window of the project and then set the time line so that it is at the first keyframe that you set for the X Offset F Curve which should be around frame 70. You can easily see where the keyframes are set by looking in the Project window. In the F Curve Editor window turn on the visibility of both the X and Y Offset F Curves and turn off the visibility of the remaining F Curves by clicking on the dots next to the name of the F Curve.

Select the Y Offset F Curve in the Editor window and make it active. Hold down the option key and then click on the Y Offset F Curve in the Editor window. Notice that a keyframe is automatically set on the curve. Now slowly click and drag the keyframe upwards. Move the keyframe up or down until the spaceship is passing through the first ring in the front view window. Repeat this process for the remaining rings.

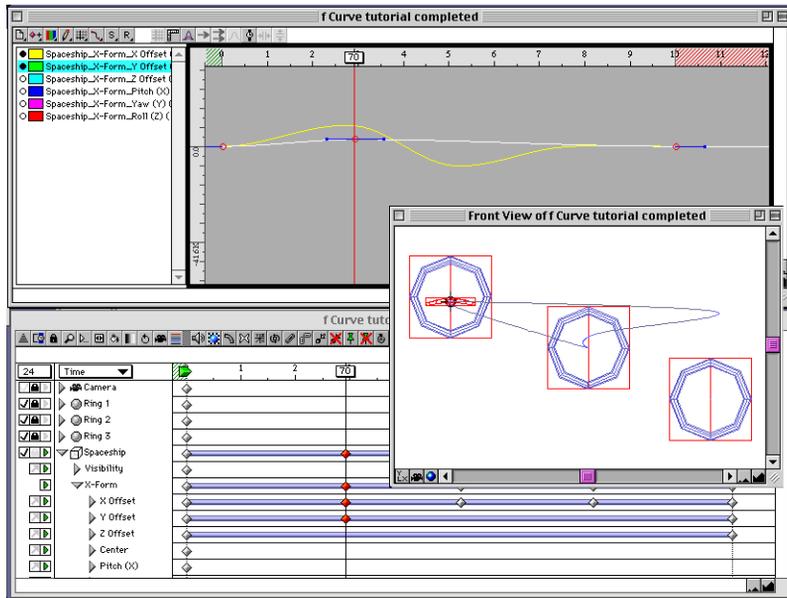


Figure 10

A keyframe can be set in the F Curve Editor window by option clicking directly on the F Curve. You can then drag the keyframe to the desired value.

Hopefully at this point you're getting the general idea. One final set of keyframes and then I'm turning you loose. Make the Pitch (X) F Curve active in the Editor window. In the side view of the project, scrub the time line until the spaceship is at the top of it's vertical

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arc where it passes through the first ring which should be at around frame 60. Set a keyframe by option clicking directly on the curve. Now move the timeline in the middle between the two keyframes and set another key by once again option clicking on the F Curve. Slowly drag the key upwards until your happy with the pitch of the Spaceship effector as seen in the side view window. Repeat this process for the remaining rings.

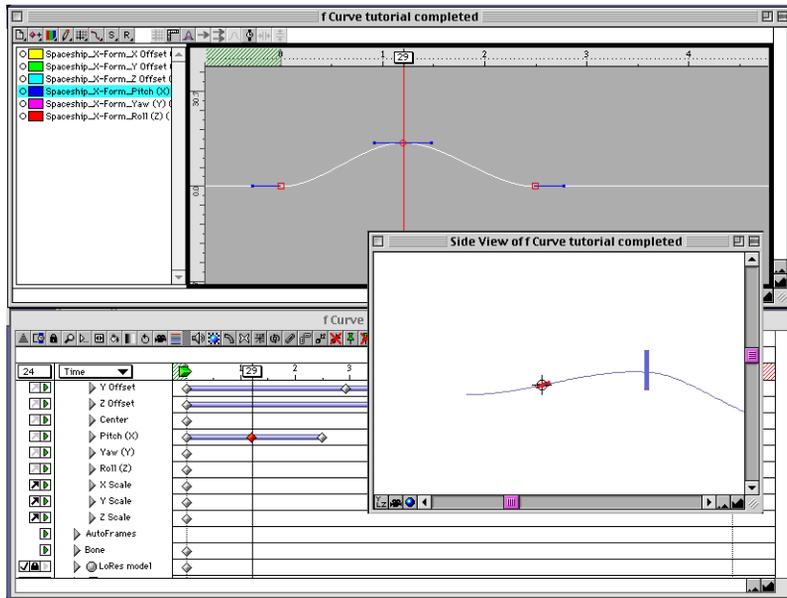


Figure 11

By bracketing a point in time with a pair of keyframes you can easily create a bell shaped curve. In this case you're controlling the pitch of the Spaceship effector.

To wrap it all up, use the same technique that we've covered to animate the yaw and roll of the Spaceship effector. Animate your camera, turn off the lo-res model and turn on the hi-res one and render away!

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Good luck...

Craig Lyn