

Using ArcGIS™ 3D Analyst™

GIS by ESRI™

Bob Booth and Steve Bratt

Copyright © 2000–2002 ESRI

All rights reserved.

Printed in the United States of America.

The information contained in this document is the exclusive property of ESRI. This work is protected under United States copyright law and other international copyright treaties and conventions. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as expressly permitted in writing by ESRI. All requests should be sent to Attention: Contracts Manager, ESRI, 380 New York Street, Redlands, CA 92373-8100, USA.

The information contained in this document is subject to change without notice.

DATA CREDITS

Exercise 1: Death Valley image data courtesy of NASA/JPL/Caltech.

Exercise 2: San Gabriel Basin data courtesy of the San Gabriel Basin Water Quality Authority.

Exercise 3: Belarus CS137 soil contamination and thyroid cancer data courtesy of the International Sakharov Environmental University.

Exercise 4: Hidden River Cave data courtesy of the American Cave Conservation Association.

Exercise 5: Elevation and image data courtesy of MassGIS, Commonwealth of Massachusetts Executive Office of Environmental Affairs..

U.S. GOVERNMENT RESTRICTED/LIMITED RIGHTS

Any software, documentation, and/or data delivered hereunder is subject to the terms of the License Agreement. In no event shall the U.S. Government acquire greater than RESTRICTED/LIMITED RIGHTS. At a minimum, use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in FAR §52.227-14 Alternates I, II, and III (JUN 1987); FAR §52.227-19 (JUN 1987) and/or FAR §12.211/12.212 (Commercial Technical Data/Computer Software); and DFARS §252.227-7015 (NOV 1995) (Technical Data) and/or DFARS §227.7202 (Computer Software), as applicable. Contractor/Manufacturer is ESRI, 380 New York Street, Redlands, CA 92373-8100, USA.

ESRI and the ESRI globe logo are trademarks of ESRI, registered in the United States and certain other countries; registration is pending in the European Community. 3D Analyst, ArcInfo, ArcCatalog, ArcMap, ArcScene, ArcGIS, ArcEditor, the ESRI Press logo, and GIS by ESRI are trademarks and www.esri.com and www.arconline.esri.com are service marks of ESRI.

Other companies and products mentioned herein are trademarks or registered trademarks of their respective trademark owners.

Exercise 5: Working with animations in ArcScene

Imagine that you wish to create an animated sequence showing the flight of an object over a landscape. You've created a TIN and have draped images over it to show the area. You also have some data pertaining to a strange phenomenon that has been occurring in the area. You are interested in displaying all the data in a dynamic way, making an animation to tour points of interest, and showing how you made the surface. You would also like to model the phenomena by moving a layer in the scene.

The tutorial data has already been assembled in the scene document named Animation.sxd. You will use ArcScene's animation tools to effectively convey the points you want to show.

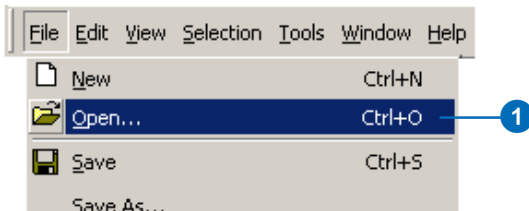
Data courtesy of MassGIS, Commonwealth of Massachusetts Executive Office of Environmental Affairs.

In this exercise, you will play an existing animation in the scene document, called Final Animation_A.sxd, and then perform the tasks typically used to create the animation.

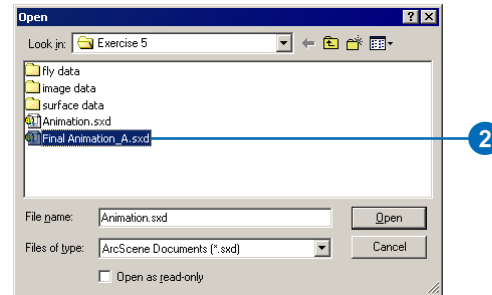
Opening the Final Animation_A scene document

In this section, you will play an animation that demonstrates some of the effects that you can create when you animate a scene.

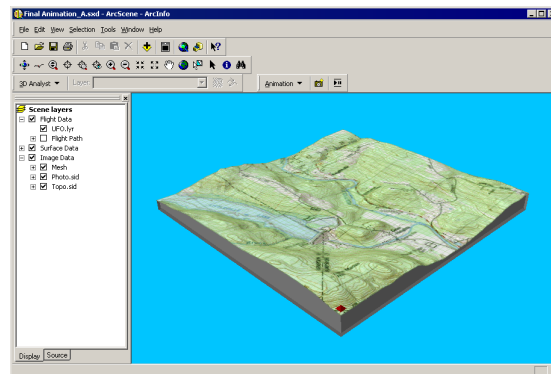
1. In ArcScene, click File and click Open.



2. Navigate to the Exercise5 folder and double-click Final Animation_A.sxd.



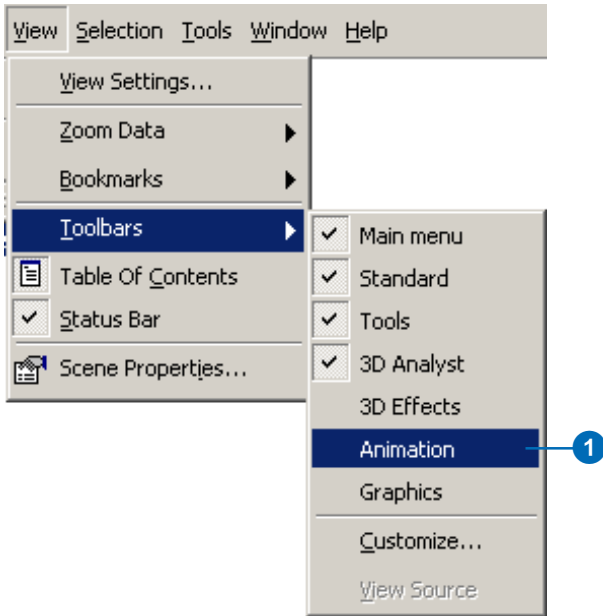
This scene contains geographic information and recorded special effects that have been combined to make an animation.



Playing the scene's animation

In order to view a scene's animation, you need to turn on the Animation toolbar.

1. Click View, point to Toolbars, and click Animation.



The animation toolbar appears. Now you'll play the animation.

2. Click Open Animation Controls.

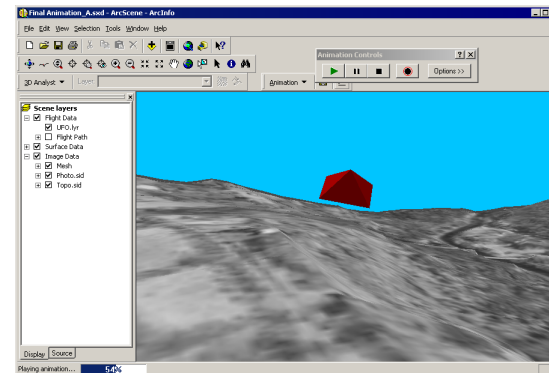


This animation shows a hypothetical UFO's flight over the terrain.

3. Click Play.



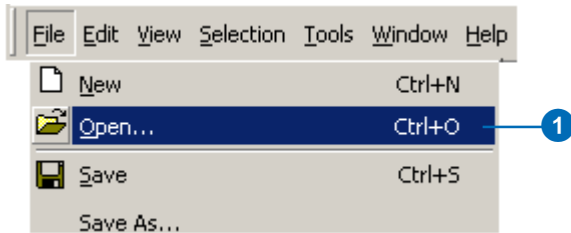
The animation plays, illustrating some of the effects you can use in an animated scene.



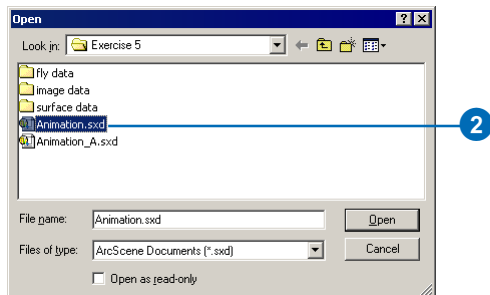
In the next section you will work through the steps used to make animations like this one.

Opening the Animation scene document

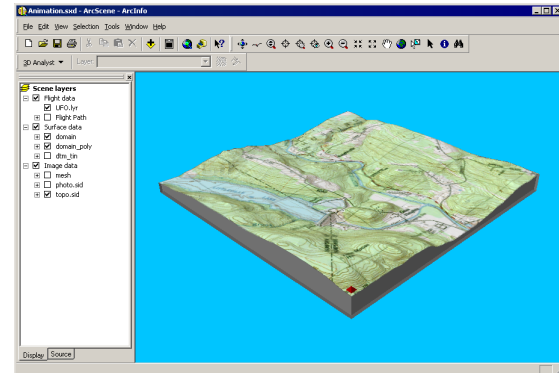
1. In ArcScene, click File and click Open.



2. Navigate to the Exercise 5 folder and double-click Animation.sxd.



The scene contains an ortho photo, a scanned topographic map, and other data you need to make your animation.



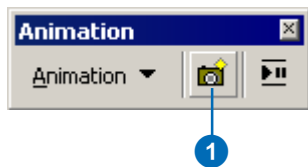
In this section, you'll use the animation tools to capture keyframes, import tracks, play back your animations, and save them to a scene document.

There are three types of keyframes that you can use to build animations. The first is a camera keyframe. A camera keyframe is a snapshot of the view you see in a scene. In this section, you will create a simple animation from a set of keyframes.

Capturing Perspective views as keyframes to make an animation

The simplest way to make animations is by capturing views to be stored as keyframes. The captured views are snapshots of camera perspectives in a scene in at particular time. The most fundamental element of an animation is a keyframe. Keyframes are used as snapshots to interpolate between in a track. You'll create a set of keyframes to make a camera track that will show an animation between points of interest in your study area.

1. Click the Capture View button to create a camera keyframe showing the full extent of the scene.



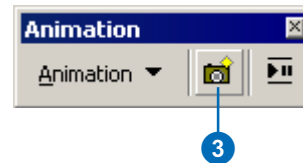
For a camera keyframe, the object is the virtual camera through which you view the scene. Navigating the scene changes camera properties that determine its position.

ArcScene interpolates a camera path between keyframes, so you'll need to capture more views to make a track that shows animation.

2. Right-click on UFO.lyr and click Zoom To Layer.



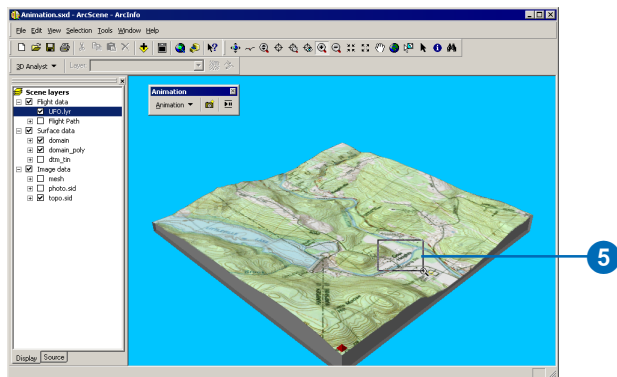
3. Click the Capture View button to create a camera keyframe showing the UFO layer.



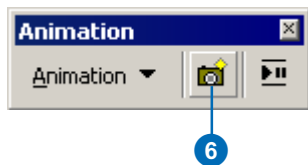
4. Click the Full Extent button to view all the data.



5. Click Zoom In on the Navigation toolbar and zoom to Goss Heights, located near the center of your view.



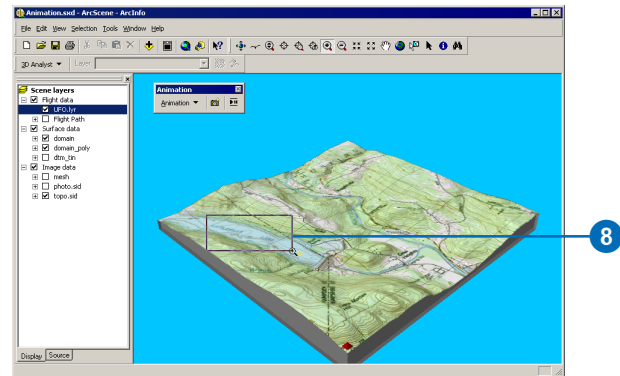
6. Click the Capture View button to create a camera keyframe of Goss Heights.



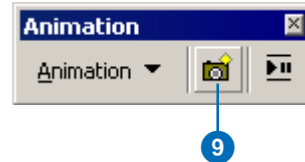
7. Click the Full Extent button.



8. Zoom to Littleville Lake.



9. Click the Capture View button to capture a view of Littleville Lake.



10. Click the Full Extent button.



The captured views you just made are stored as a set of camera keyframes in a camera track. When the track is played, it shows a smooth animation between the keyframes. Next, you'll play your animation track.

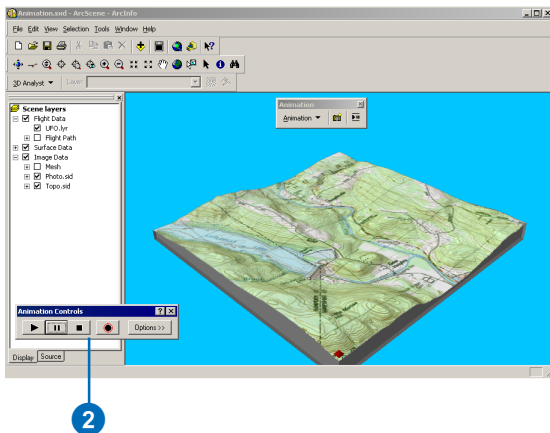
Playing back your animation

You will play back animations using simple tools that resemble the controls of a video cassette recorder (VCR).

1. Click the Open Animation Controls button.



2. Click the Animation toolbar and drag it to the lower-left corner of the scene so it won't block your view of the tools or data.



3. Click the Play button.



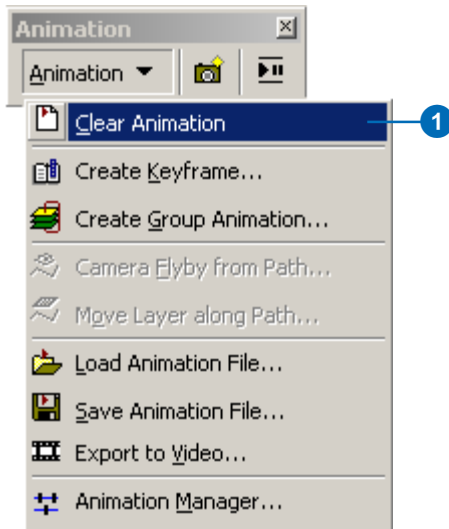
An animation is played back by interpolating the camera position between the keyframes in the track. In this case, the animation shows a virtual tour through the views you captured.

Clearing an Animation

If you want to start over, you can erase all the tracks you created. In this section, you'll remove the tracks you just created so you can improve your animation.

1. Click Animation and click Clear Animation.

All animation tracks are removed from the scene.

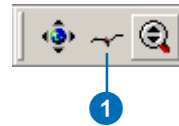


Recording navigation

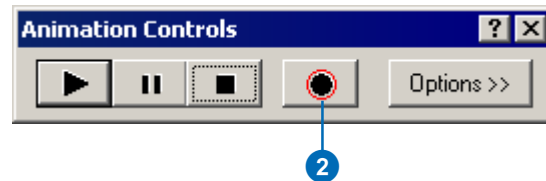
Another way to create a camera track for an animation is to record in real-time while you navigate in a scene. In this section, you will record your view of the scene while you navigate using the Fly tool.

1. Click the Fly tool on the navigation toolbar.

The Fly tool allows you to fly through your scenes.

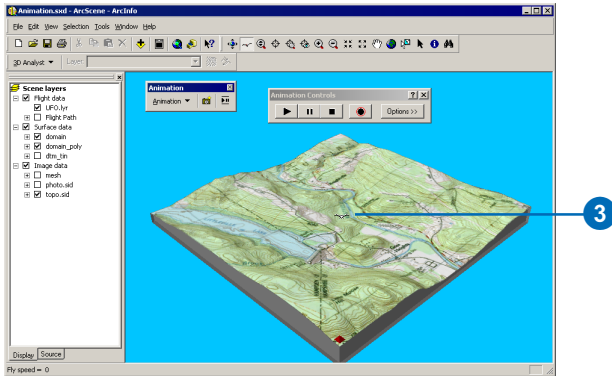


2. Click the Record button to start recording your navigation.



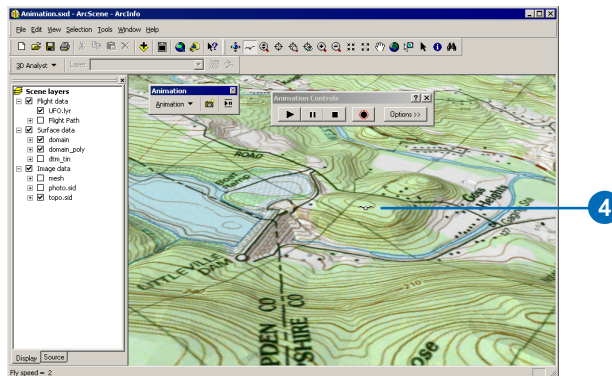
ArcScene begins recording as soon as you click the Record button. If you don't navigate right away, your track will reflect this.

- Click once in the center of the scene to activate the Fly tool. You start flying by entering into hovering mode.

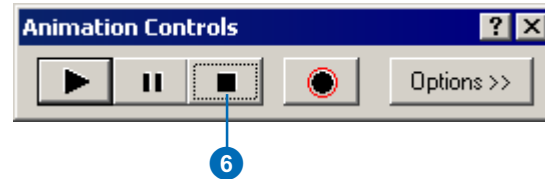


In this mode your viewpoint follows the cursor. Point in the direction you wish to look.

- Click once more to begin flying through the scene. Point in the direction you want to move. Click again to increase your speed and right-click to decrease your speed. Your speed is indicated in the status bar in the lower-left corner of the ArcScene window.



- Press Esc to stop flying. You can also stop flying by right-clicking until your speed is zero.
- Click Stop to finish recording.

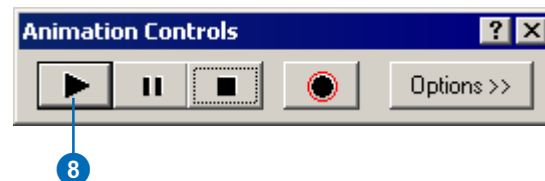


You have recorded your flight path through the scene as a new camera track that began when you clicked the Record button and ended when you clicked the Stop button.

- Click the Full Extent button.

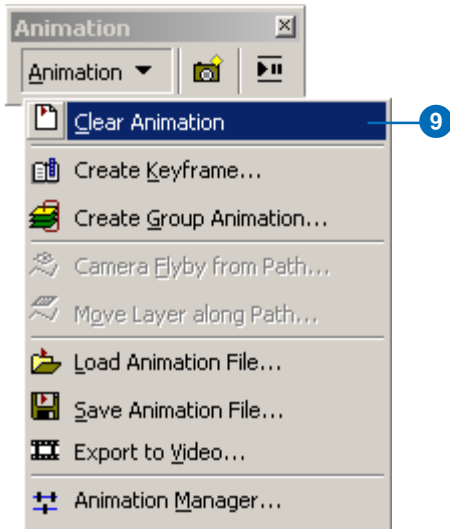


- Click the Play button to see the animation you recorded.



When you are done viewing the animation you recorded, clear the track so you can make a better one in the next section.

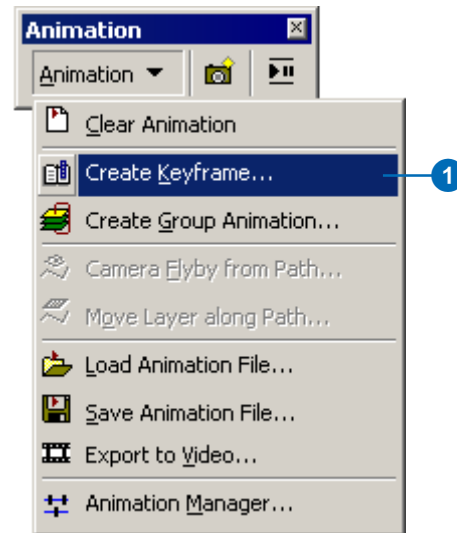
9. Click Animation and click Clear Animation.



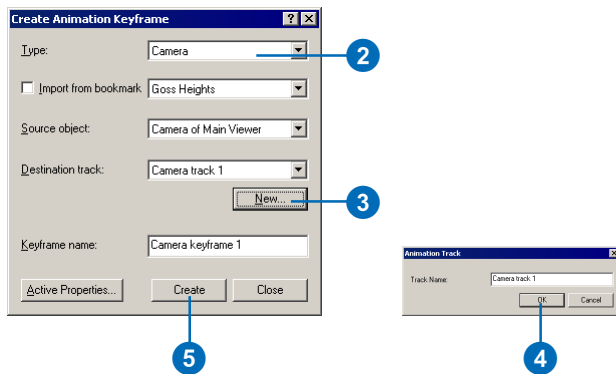
Making a camera track from 3D bookmarks

In the previous sections, you navigated in a scene and created keyframes to build a camera track. Another way to create the keyframes for a camera track is to import bookmarked perspective views of a scene. In this section, you'll create keyframes from 3D bookmarks.

1. Click Animation and click Create Keyframe.

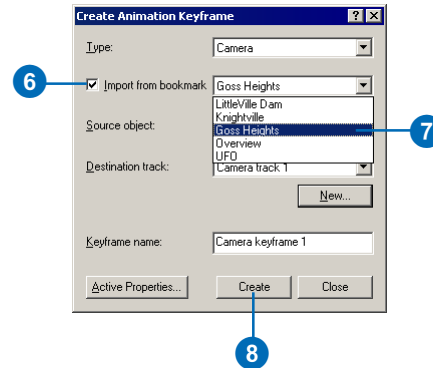


2. Click the Type dropdown arrow and choose Camera.
3. Click New to create a new track.
4. Click OK.
5. Click Create.



You've now created a camera track with one camera keyframe showing the full extent of your scene. You'll need to add more keyframes to your track so that it will show animation. Now, you'll import bookmarks to create the keyframes for the rest of the animation.

6. Check Import from bookmark.
7. Click the Import from bookmark dropdown arrow and click Goss Heights.



8. Click Create to make the second keyframe in your track.
9. Click the Import from bookmark dropdown arrow and choose Littleville dam.
10. Click Create to import this bookmark as a keyframe.
11. Click the Import from bookmark dropdown arrow and click Knightville.
12. Click Create to make the Knightville keyframe.
13. Click the Import from bookmark dropdown arrow once more and click Overview.
14. Click Create to create a keyframe showing all the data.

15. Click Close.
16. Click the Play button.

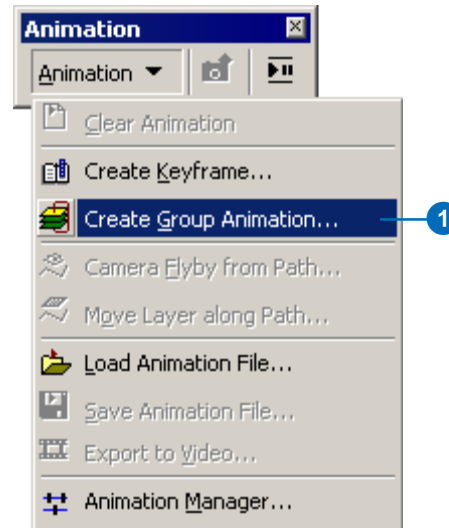


The camera track plays, moving the camera through the set of keyframes you imported from existing 3D bookmarks.

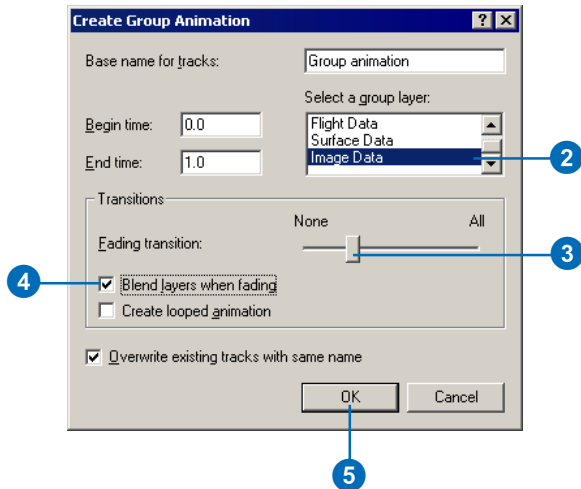
Switching the visibility between layers using a group animation

Now that you have explored some of the ways to create an animated camera track from keyframes, you'll learn how to change the way layers in a scene are displayed during animation. In this section, you will switch the layer that is draped over the terrain model to show different ways of representing the terrain.

1. Click Animation and click Create Group Animation.



2. Select the group layer named Image Data.
3. Slide the Fading Transition about a quarter of the way to the right.
4. Check Blend Layers When Fading.
5. Click OK.



The layer track you just created toggles the visibility of successive layers to animate a progression between them. The transition settings you modified show a smooth blending between the layers in the progression.

6. Click the Play button to watch your animation.

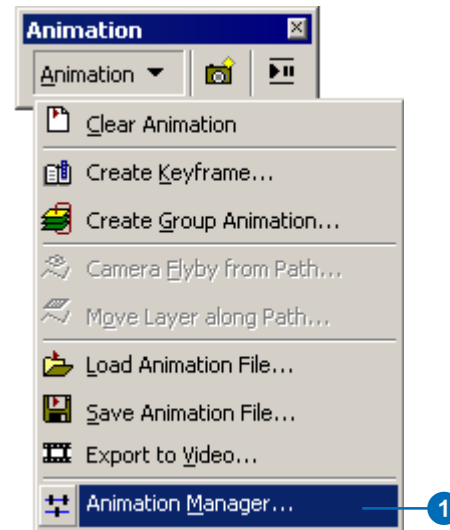


Since you didn't clear the animation track you made from the keyframes, it plays in addition to the layer tracks you just created. However, you can stop the camera track from playing. You'll do this next.

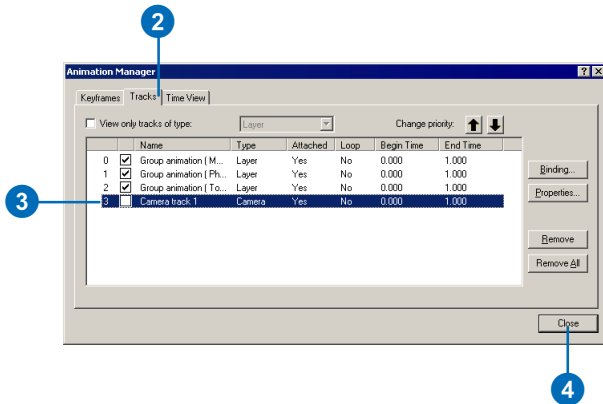
Using the Animation Manager to disable a track from playing

The Animation Manager allows you to control many properties of an animation. In this section, you'll use the Animation Manager to stop a camera track from playing.

1. Click Animation and click Animation Manager.



2. Click the Tracks tab.
3. Uncheck Camera Track 1.
4. Click Close.



You have disabled the camera track. Now it will not play as part of the animation.

5. Click the Play button.



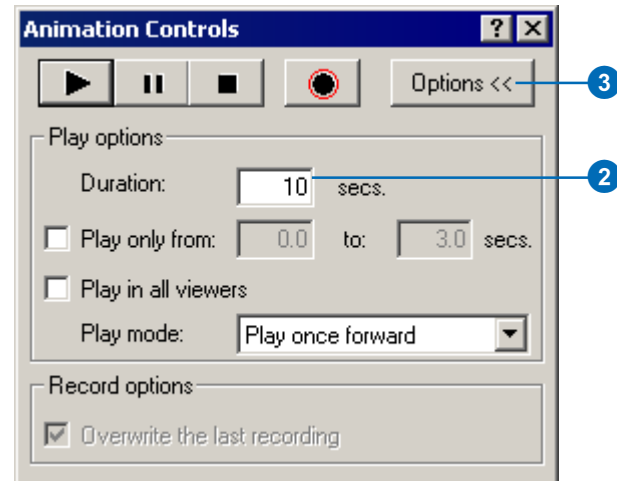
The animation plays again, only showing the layer tracks this time. It may now seem that the duration of the animation is too long. You can control the amount of time in which an animation is played.

Using Animation Controls to adjust the playback duration

1. Click Options.



2. Type "10" in the Duration text box.
3. Click Options to close this portion of the dialog box.



4. Click the Play button.



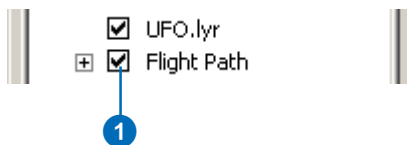
The animation now plays more quickly.

Moving an object along a predefined path

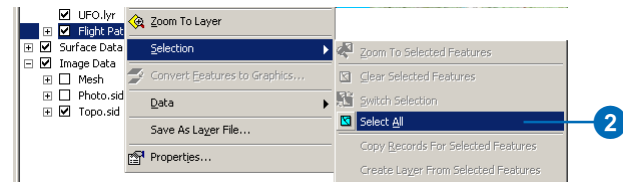
One of the things an animation allows you to do is move an object through a scene. You can add a layer containing a model vehicle and move it through the scene along a specified track.

You can choose to move a layer along a selected line feature or graphic. The scene contains a graphic layer with a model UFO that was created using Visual Basic code. In the next set of steps, you'll fly the model UFO along a shapefile that shows its flight path.

1. Check Flight Path.

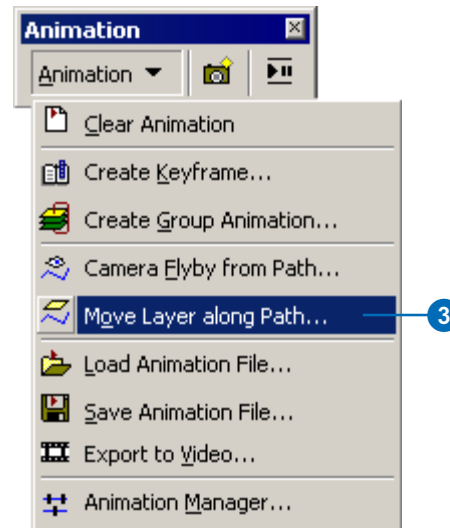


2. Right-click Flight Path, point to Selection, then click Select All.

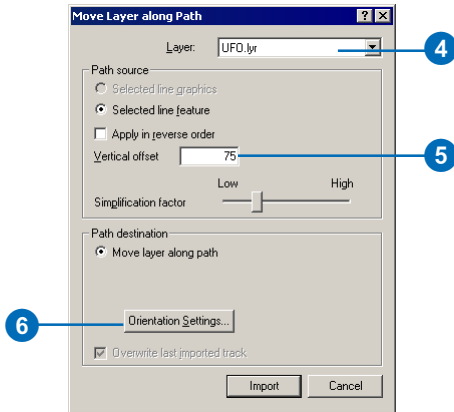


You can also use the Select Features or Select Graphics tools to select the path you want to use. A path is constructed from a single selected line feature or graphic.

3. Click Animation and click Move Layer along Path.



- Click the Layer dropdown arrow and click UFO.lyr.

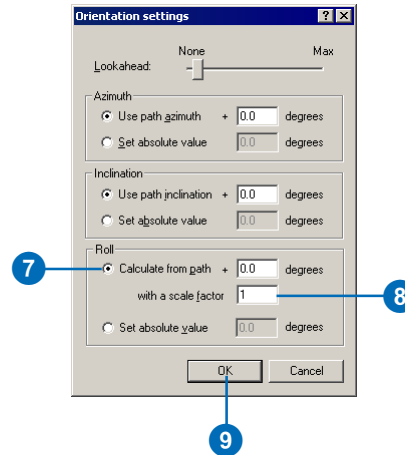


- Type a Vertical offset of “75”. This will make the object appear to fly above the surface.

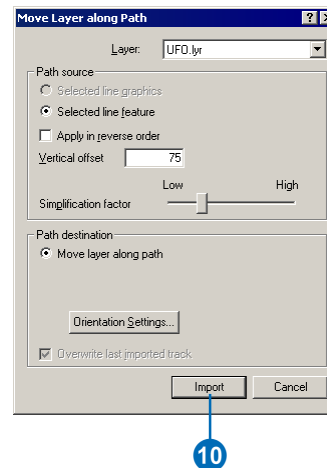
ArcScene can improve the simulation of flight of an object, such as an airplane, along a path by making the object point in the direction it is moving and by rolling it from side to side as if it were banking. In the next steps, you’ll define a roll for the UFO layer.

- Click Orientation Settings to modify the layer’s position while it’s animated.
- Click Calculate from path to calculate the layer’s roll based on the path’s shape.
- Type “1” as a scale factor.

- Click OK.

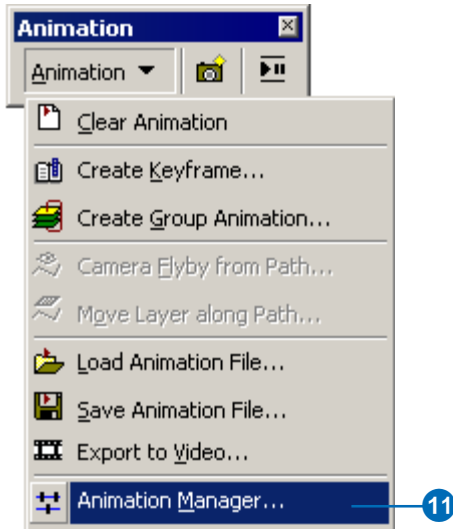


- Click Import to import the selected line as a flight path.



The UFO layer moves along the selected path. The movement is stored as a set of layer keyframes in a layer animation track. Now you'll disable the tracks you created previously so that just the UFO track is played.

11. Click Animation and click Animation Manager.

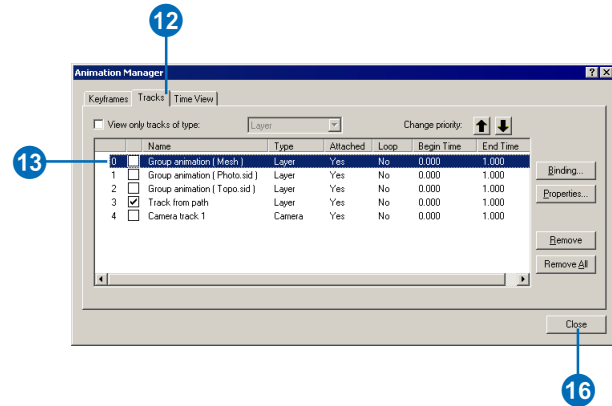


12. Click the Tracks tab.

13. Uncheck Group animation (Mesh).

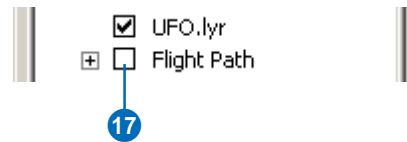
14. Uncheck Group animation (Photo.sid).

15. Uncheck Group animation (Topo.sid).



16. Click Close.

17. Uncheck Flight Path to turn off the visibility of this layer.



18. Click Play.

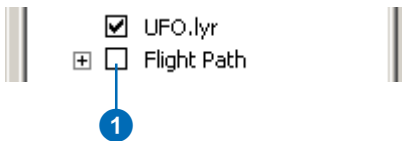


The UFO flies along the path you indicated. Next, you'll move the camera along a predefined path.

Creating a camera flyby from a path

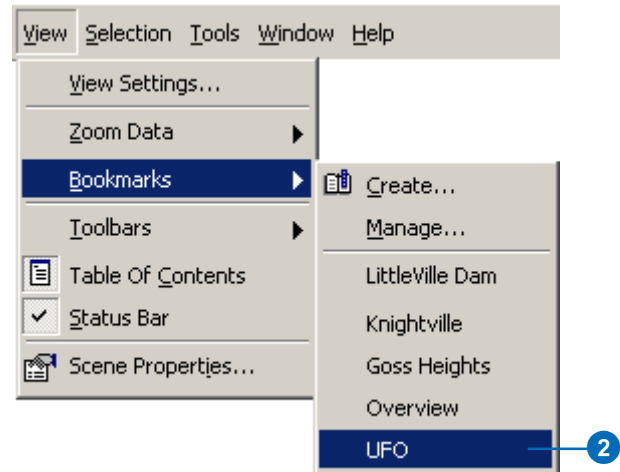
You can move a camera along a flight path in the same way you just moved a layer along a path. Next, you'll combine the track you made in the last step with one that will point the camera at the UFO as it flies.

1. Check Flight Path, make sure the line you chose for your path is still selected, then uncheck Flight Path.

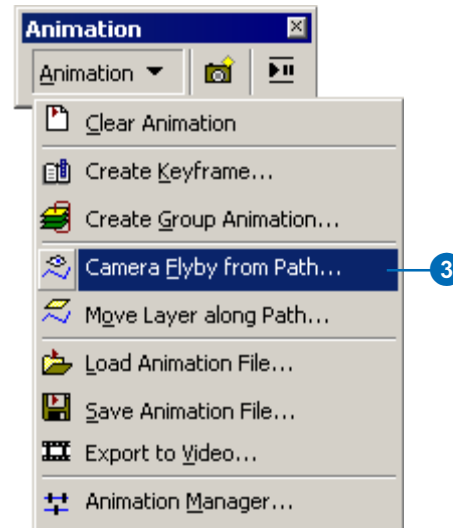


You'll move the camera location to a predefined location in the center of the scene that will give you a better vantage point from which to view the UFO layer as it is moved.

2. Click View, point to Bookmarks, then click UFO.

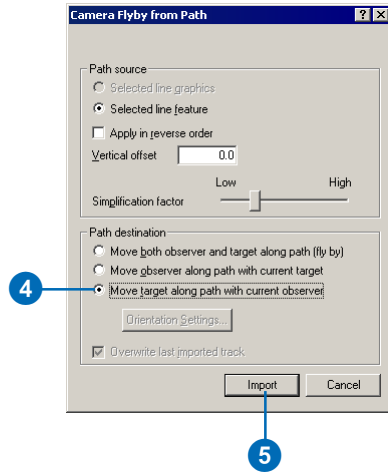


3. Click Animation and click Camera Flyby from Path.



4. Click the third path destination option.

This option lets you observe the UFO as it moves along the path.



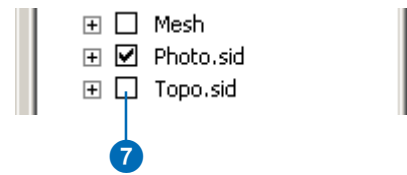
5. Click Import.

6. Click the Play button.



Both tracks play. The UFO layer moves and the camera follows its movements.

7. Uncheck Topo.sid to make the ortho photo visible.



The animation is playing too quickly. Next, you'll learn how to adjust the duration that the animation is playing to enhance the visual effect.

8. Click Options.



9. Type “30” in the Duration text box.



10. Click Options to minimize the dialog box.

11. Click the Play button.

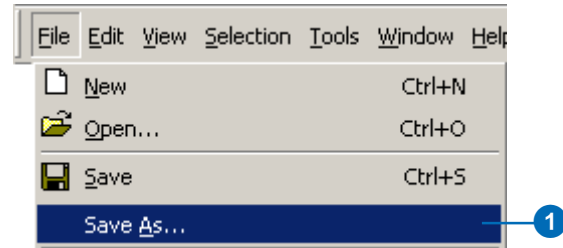


Now the animation plays more slowly as the UFO flies over the terrain.

Saving an animation in a scene document

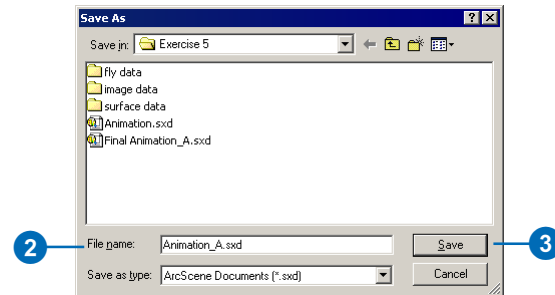
You can save animation tracks in a scene document. In the next step, you'll save the animations you made in a scene document.

1. Click File and click Save As.



2. In the File name text box, type “Animation_A.sxd”.

3. Click Save.



The new scene document is created, storing the animation tracks.

In this exercise you learned how to create and save simple animations that help you better visualize 3D data. There are other more advanced ways of creating, saving, and sharing animations. For more information, see Chapter 8, ‘Animation’.