Section 19: Mission Planning with Virtual GIS

Section Objective

To become familiar with the IMAGINE VirtualGIS interface and to develop the use and management of Visualization Tools.

Tools Used

Virtual GIS Viewer	The screen for rendering 3D DEMS, raster overlays and vector and/or annotation feature layers.
Navigation Tools	Selected modes for moving through the displayed scene
Flight Path Editor	Create, edit, save, load and display flight paths.
Vector Tools	Overlay the current DEM, top raster, or annotation layer and control the coverage display
Annotation Tools	Overlay the current DEM, top raster layer or vector layer and control how the cover is displayed.

Class Notes

Mission Planning with VirtualGIS

Task 1: Starting VirtualGIS and Opening a DEM

Students will display a digital elevation model (DEM) and drape a raster image.

1. From the ERDAS IMAGINE eWorkspace, click **File > New > 3D View.** A 3D View displays.
2. **Close** the 2D View.
3. Select **File > Open > DEM.**
4. Click once on ***dem_30m.img***

5. Click the **Raster Options** tab.

6. Leave the **VirtualDEM** option enabled and check the **Load Quickly** option. Click **OK**. The elevation model displays.

7. Click the Scene tab. This tab contains all of the setting for your VirtualGIS scene.

8. Select **Scene > Scene Properties** 

. The Scene Properties dialog appears.

   This dialog allows you to change many of the display parameters of the DEM.

   Viewing Range: Allows you to set the viewing distance of the observer. The number is the maximumm distance from the observer that data is rendered.

9. Click the **Background** tab.
10. Click the **Background Type** pull-down arrow and select **Image.** This allows you to use an image file as the background.
11. Click the **Browse** icon  and navigate to the data folder. Select **sky.img.**

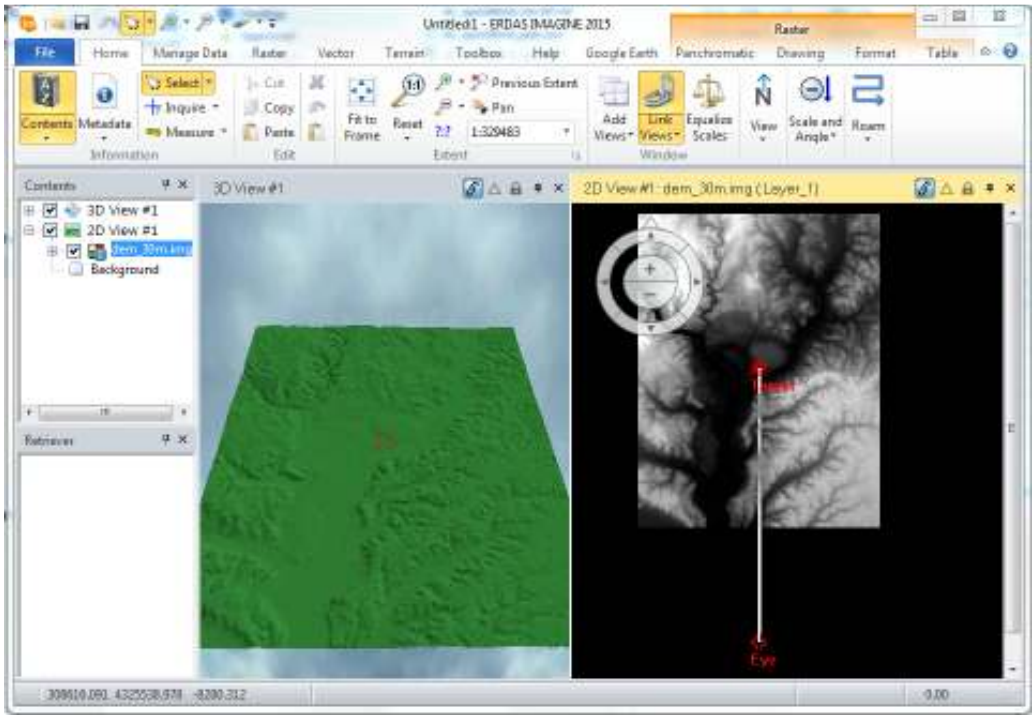
    What other types of background are available?

12. In the Scene Properties dialog, click **Apply** and **Close.**
13. To further define your viewing dimensions, From the **Scene** tab select

    Create Overview  **> Create Linked Overview.**

This opens a 2D View containing;

- **Eye** and **Target** locators
- The DEM which was loaded in the 3D Viewer.

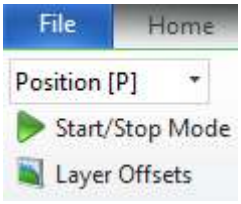


14. Move the **Eye** or **Target** icon to see what effect takes place.
15. To zoom in on the DEM click in the 3D View and zoom, then readjust the **Eye** or T**arget** locators in the 2D View.
16. Leave both views open for the next task.

Task 2: Raster Image Overlay

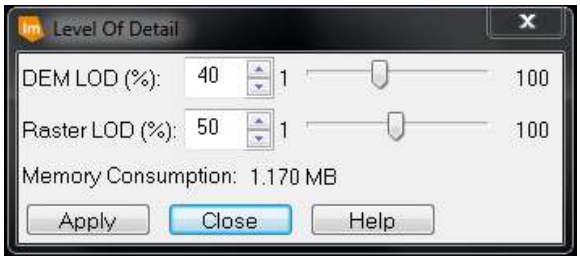
1. Select the 3D View and click the **Open** icon on the Quick Access menu. You can also choose **File** > **Open** > **Raster Layer.**
2. Navigate to the Outputs directory and select ***mosaic.img*.** Click **OK.**

   Click **OK** on any warnings dialog.
3. From the Home tab, click **Fit to Frame** **.** (This can also be accomplished with **RMB** > **Zoom to Data Extent**.)
4. In the **Scene** tab > **View** group, ensure that the Navigation Mode is set to **Position** and then double-click on the National Mall portion of the image.



This causes the view to zoom in on the National Mall area.

5. Select **Scene** tab > **Scene** group > **Level of Detail**. This displays the Level of Detail dialog.



6. Change the **DEM LOD (%)** values to **40**.
7. Change the **Raster LOD (%)** values to **50**, click **Apply** and **Close.**

The VirtualGIS Viewer also has an Inquire Cursor similar to the standard Viewer.

8. From the Home tab, click the **Inquire Cursor** Inquire button. The VirtualGIS Viewer Inquire Cursor information dialog displays, along with a 3D Inquire Cursor in the VirtualGIS Viewer.

9. You will notice the navigation has been automatically set to **Selection** mode.

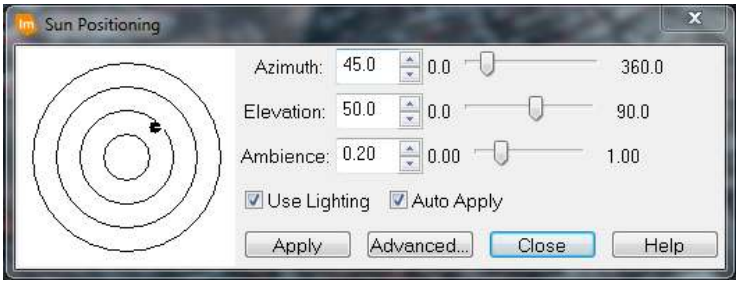
10. To move the cursor, click and drag the crosshair to a different location.

What is the height value at: 323433 4306225?

11. **Close** the Inquire Cursor dialog.

12. From the Scene tab, select **Illumination** **> Sun Position.**

    The Sun Positioning dialog displays.



Within the dialog's graphic box, the **dot** represents the position of the sun. The further the dot is from the center in the example box, the darker the shadowing in the image. Moving and relocation the dot within the example box affects the image in the same way(s) that the position of the sun affects every day light.

13. Enable the **Auto Apply** checkbox.
14. Grab the **dot** drag it to different locations to change the shadowing in the 3D View.
15. Adjust the **Ambience** bar to view the changes that this causes.
16. Click **Close** to dismiss the sun position dialog.
17. Leave both views open for the next task.
18. From the ERDAS IMAGINE eWorkspace, click **File > New > 3D View.** A 3D View displays.
19. **Close** the 2D View.

Task 3: Creating a Project File

1. From the VirtualGIS Viewer select **File > Save as > Project As.**
2. In the Save VirtualGIS Project dialog, navigate to your **Outputs** directory and as the output **File Name** type ***DC.vwp***. Click **OK.**
3. Close the 3D View.
4. Open a new **3D View** and click **File > Open > VirtualGIS Project.** Click the **Recent** button and select ***DC.vwp*** from the list that Appears. Click OK.

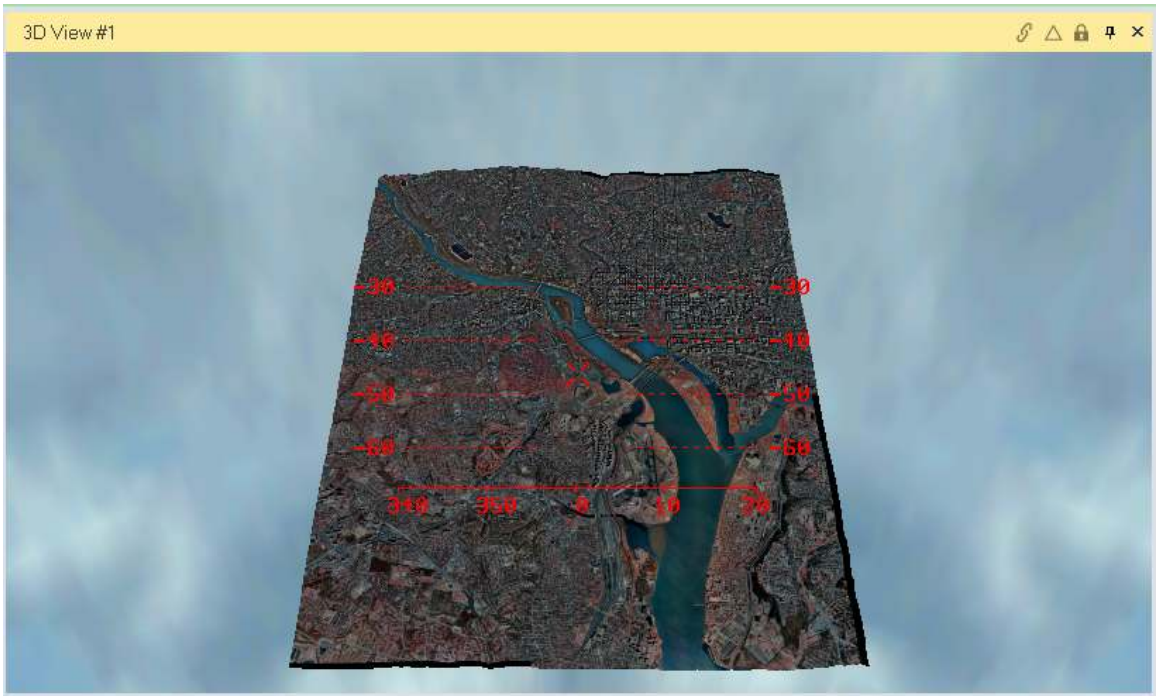
All of the previously opened files have been reopened as part of the project file.

5. Leave the 3D View open for the next task.

Task 4: Set Up for Navigation

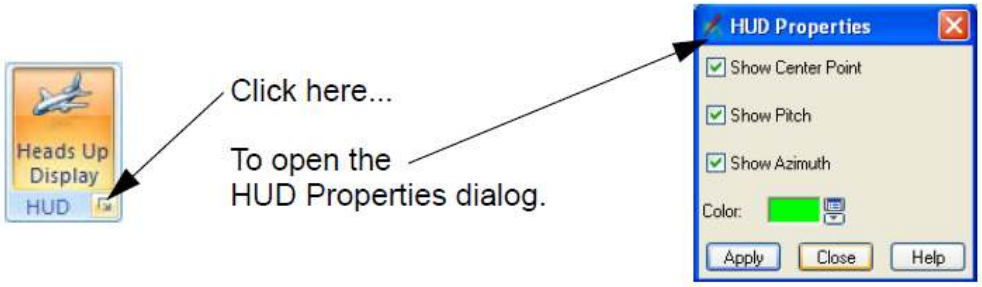
You should have a Virtual GIS Viewer open, displaying a 3D scene of ***dem_30m.img*** with ***mosaic.img*** draped over it.

1. From the Scene tab, click  **Heads-Up-Display.**



This display allows you to continually view the pitch and azimuth information of your Point of Observation.

2. Select **Navigation > HUD Properties.** This displays the HUD Properties dialog (HUD – Heads up Display.

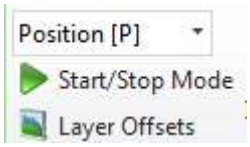


3. Click the bottom half of the **Color** pop-up button  and select **Green.** Click **Apply** and **Close.**

Task 5: Position Mode

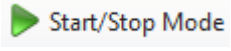
There are several navigation modes within IMAGINE VirtualGIS. The position mode can be set from the Navigation pull-down menu.

1. Change the **Navigation Mode** to **Position.** This mode allows you to adjust your viewing angle, as well as move forward and backward within a scene.



2. To navigate within the 3D View, use the following:

   - To alter the observer's azimuth (direction of view), **LMB** click and drag left or right.
   - To alter the observer's inclination or pitch, **LMB** click and drag up or down.
   - To move forward or backward, click and drag the **MMB** up or down.
   - To move to a specific point, **LMB** double-click in the scene.

3. To begin **Continuous Motion** within the Viewer, toggle on the **Start/Stop Mode** 

4. To control the direction and pitch of the flight **LMB** click, as above.

   During motion, what does the MMB do?

5. Toggle off the **Start/Stop** button to stop motion.

Task 6: Alter the Scene Rendering Parameters

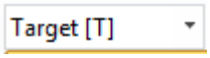
If movement within the Viewer is slow, you can alter the degree of rendering.

1. Select **Fallback > Mode > On Motion,** then select **Fallback > Quality > Wire Frame.**
2. Now try navigating through the scene.
3. Once you have seen the effect of this, reset it by selecting **Fallback > Mode > Off.**

   What happens when you start to move and when you release the button?
4. Return to the initial observer location by clicking **RMB > Zoom to Data Extent.**

Task 7: Target Mode

1. Press the **T** key on your keyboard to change the **Navigation Mode** to **Target.**



2. **LMB** double-click anywhere in the 3D Viewer to position the **Target** point. The scene will be updated in the center of the window (Center of HUD) with this point.
3. To move within the VirtualGIS Viewer:

    - To rotate around the target point, click and drag the **LMB** (left/right or up/down).
    - To move closer to or further from the target point, click and drag the **MMB** (up or down).

4. Turn on the **Start/Stop Mode** again within the viewer. This will rotate the Observer Point around the target.
5. Turn off the **Start/Stop Mode** to stop motion.
6. Once you are comfortable with this navigation mode, use the **Zoom to Data Extent** to reset the scene.

Task 8: Bird's Eye Mode

1. Change the **Navigation Mode** to **Bird's Eye.**
2. Reposition this dialog so that it is below the VirtualGIS Viewer.
3. Navigation within the mode is designed to simulate the flight controls on an aircraft.
    - To fly through the scene, **LMB** click and drag. The position of the cursor will steer. Note the pitch controls (tilting the view up and down) are inverted.
    - To alter the observer's azimuth (direction of view), **MMB** click and drag left or right.
    - To alter the observer's inclination or pitch, **Scroll** up or down.
    - To move forward or backward, click and drag the **MMB** up or down.
    - To move to a specific point, **LMB** double-click in the scene.
4. Use **Zoom to Data Extent** to reset the view to its original extent.

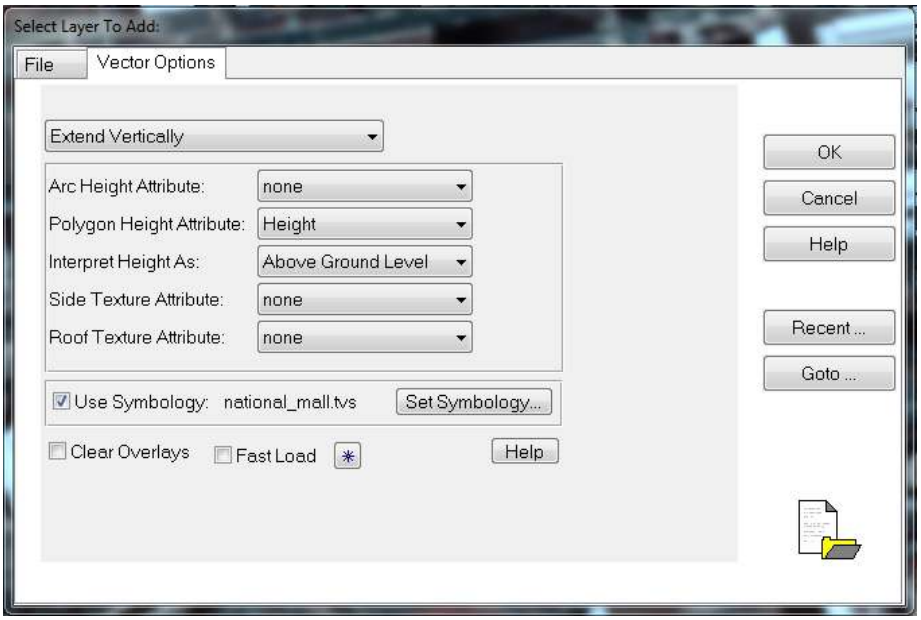
Task 9: Terrain Following Mode

1. Change the **Navigation Mode** to **Terrain.** This mode allows you to move along the terrain at a constant height.
2. Within the VirtualGIS Viewer:
    - **LMB** click and drag to change the view direction.
    - **MMB** click and drag to move forward or backward.
3. Toggle on the **Start/Stop Mode** to begin continuous motion.
4. To change the Observer Direction during Continuous Motion, click and drag using either mouse button.
5. To alter the distance that this mode is offset from the ground, click the **Scene Properties** button.
6. Click the **Motion** tab and change the **Terrain Offset** to **50.**
7. Click **Apply** and **Close.**
8. Once you are comfortable with this navigation mode. **Zoom to Data Extent**.
9. Turn off the Heads-Up-Display by clicking **Heads-Up-Display** 

Task 10: Shapefiles in a 3D Scene

You should have a VirtualGIS Viewer open, displaying a 3D scene of **dem_30m.img** with **mosaic.img** draped over it. In this exercise, you will display vector and annotation layers over this data.

1. Click **File > Open > Vector Layer.** Ensure that the **Files of Type** is set to **Shapefile**.
2. Navigate to the **Shapefiles** directory and select ***national_mall.shp.***
3. Click the **Vector Options** tab. Click the pull-down arrow and select **Extend Vertically.**



4. Click the pull-down arrow for **Polygon Height Attribute** and select **Height**. Click **OK.**

For this shapefile, the values stored in the Height column of the attribute table will be used to vertically extend the vector polygons.

Task 11: Annotation Layers in a 3D Scene

IMAGINE VirtualGIS can handle ERDAS IMAGINE Annotation files.

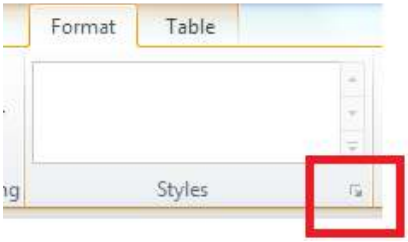
1. Click the **Scene** tab **> View** group **> Create Overview** **> Create Unlinked Overview.** This opens a 2D View containing the DEM, ***mosaic.img*** and ***national_mall.shp***.
2. To create an annotation file in the 2D View select the view and go to **File > New > Annotation Layer.** The annotation Layer dialog displays.
3. In the **File Name** text box, type annotation.ovr, then click **OK.** This creates a 'blank' annotation layer, into which you will insert your new annotation.
4. With ***annotation.ovr*** layer selected in the Contents Pane, change to the **Drawing** tab and select **Insert Geometry** group > **Text** .
5. Move the cursor into the Viewer and then click within the Reagan National Airport

   (MGRS – 18SUJ2286402108)
6. In the **Enter Text String** area of the Annotation Text dialog, type **Reagan National Airport**. Then Click somewhere in the 2D View.
7. With the text box still selected, click the **Format** tab.
8. From the font group **Units** drop down list, select **Map**.
9. Change the size to **100**. Change the color to something bright.
10. Click **Apply** and **Close.**

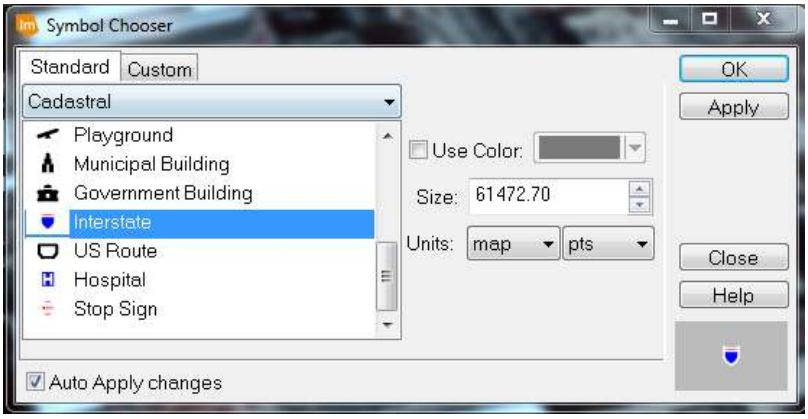
11. Repeat the previous steps to place text over some other recognizable features.

Next, you will add a symbol annotation to the file.

12. With ***Annotation.ovr*** selected in the Contents Pane, but no text elements selected in the layer, click the **Customize Styles** button.



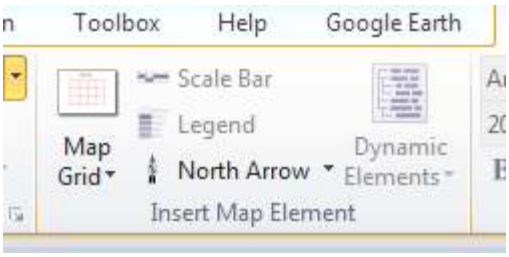
13. From the Styles dialog select the **Drop Down** next to **Symbol Style.**
14. Select **Other** from the list. The Symbol Chooser dialog box appears.



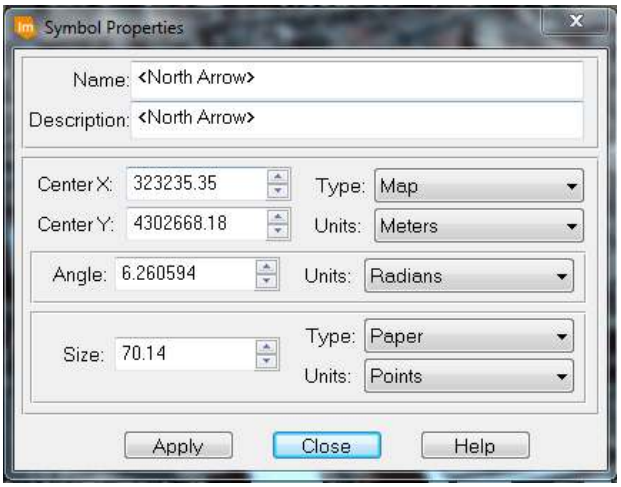
15. Ensure the main drop-down menu is set to **Cadastral** and select the **Interstate** symbol.
16. Disable the **Use Color** checkbox and set the **Units** to **map.**
17. Click **OK** in the Symbol Chooser dialog.
18. In the Insert Geometry group, click the **Point** icon and click in the Viewer over the main road (i-395) running diagonally through the image from the lower left-side. (MGRS – 18SUJ2101204007)
19. Resize the **Interstate** symbol.

Next, you will add a north arrow annotation to the file.

20. From the **Insert Map Element** group, click **North Arrow.**



21. Click somewhere in the **2D View** to place the North Arrow.
22. Drag the handles on the North Arrow to make it larger.
23. Double-click on the North Arrow to bring up the **Symbol Properties.**
24. Change the **Units** to **Map.**

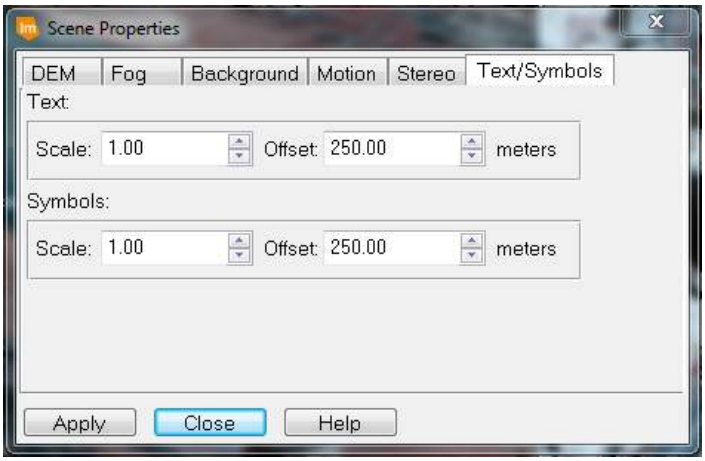


25. Click **Apply** and **Close.**
26. Click the **Save** icon to save the changes made to the annotation file.
27. To overlay the annotation file in the 3D View, select the 3D View then click **File > Open > Annotation Layer.**
28. Click the **Recent** button and select the recently created file: ***annotation.ovr***.
29. Click the **Annotation Options** tab, enable the **Extend Vertically** option then click **OK.**

    You should now see your text in the scene, standing upright as if on a billboard.
30. Navigate around your image to view the annotation from different angles.

    Note that the text and symbol markers billboard in the scene, but the North arrow remains draped, always pointing North.

31. Click the **Scene Properties**  and select the **Text/Symbols** tab.



32. Change the **Text Offset** and **Symbols Offset** to **250** meters. Click **Apply** and **Close.**
33. Navigate around your image to view the annotation from different angles.
34. Click **File > Save Project** to save the changes made to the Project file.
35. **Close** the 2D Viewer.
36. Leave the 3D Viewer open for the next task.

Task 12: Creating a Flood Surface

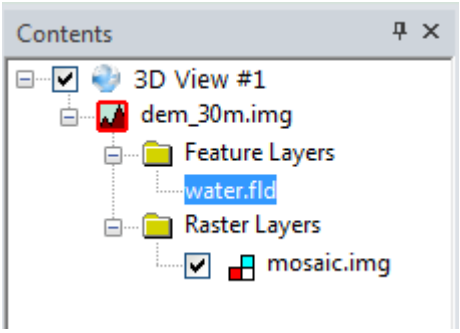
You should have a VirtualGIS Viewer open, displaying a 3D scene of ***dem_30m.img*** with ***mosaic.img*** draped over it.

1. On the **Scene** tab, click the **Scene Properties**  and set the **Exaggeration** value to at least **2.000**.
2. Click **Apply** and **Close.**

You may want to make shading adjusment, using the Sun Positioning tool.

3. Select **File > New > Water Layer.** In the Create Water Layer dialog, navigate to the **Outputs** directory and in the File text box, input **water,** press **Enter**, then click **OK**.

Nothing in the display will change, but there should now be a new water.fld latyer in the Contents Pane.



4. Select ***water.fld*** in the Contents Pane and then select the **Water** tab.
5. From the **Water** tab, select  **Fill Entire Scene.**
6. Next, select  **Water Elevation.** The Water Elevation dialog displays.

In this dialog there are two means of increasing or decreasing the Elevation:

- Elevation dial
- Elevation value

7. In the Water Elevation dialog, enable the **Auto Apply** checkbox and then modify the **Elevation** value to **15.** Press **Enter**. This will decrease the flooded area.

8. Position the cursor on the **Elevation dial**, hold down the dial and drag it to change the Elevation value.
9. Change the **Delta** to **1** and re-adjust the **Elevation** dial.

You will need to click Apply only if the Auto Apply checkbox is not enabled.

The flood level in the Viewer will decrease or increase, respectively, as you rotate the elevation dial up or down.

10. Click **Close** in the Water Elevation dialog.
11. Select **Water > Display Styles**  . The Water Display Styles dialog displays.

12. Click the drop-down menu next to **Water Color**. The color Chooser dialog displays.
13. From the Color Chooser menu choose **Custom.**
14. Grab the **dot** in the Custom Color wheel and change the water's color to a darker **blue.**
15. Ensure the **Use Opacity** checkbox is enabled.
16. Adjust the Opacity to **3.00**.
17. Click Apply and Close in the Color Chooser dialog.
18. Enable the **Reflections** checkbox, click **Apply** and **Close.**
19. From the Contents Pane, **RMB** on the ***water.fld*** layer and select **Remove Layer.**
20. Re-adjust the Scene Exaggeration back to **1.000**
21. Leave the 3D View open for the next exercise.

Task 13: Placing 3D Models in VirtualGIS Scenes

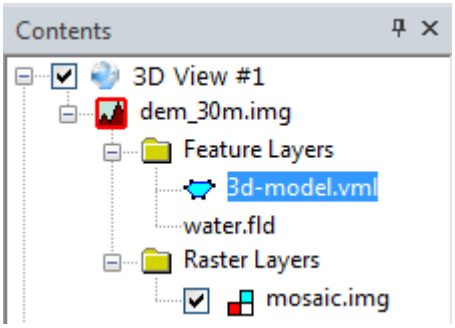
Students will place 3D model files as model in an IMAGINE VirtualGIS scene.

You should have a VirtualGIS Viewer open, displaying a 3D scene of ***dem_30m.img*** with ***mosaic.img*** draped over it.

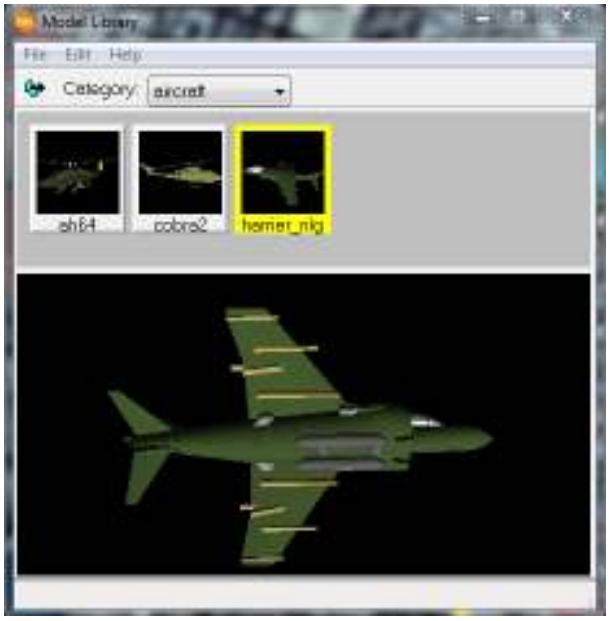
1. From the eWorkspace select **File > New > Model Layer.**
2. In the Create Model Layer dialog that displays, type **3d_model.vml** in the **Model Layer** text box, the click **OK.**

   Nothing will appear in the 3D View, but a new Model Feature Layer should now be displayed in the Contents Pane.

3. Select the ***3D_model.vml*** layer and then select the **Model** tab.



4. Select **Model >**  **Model Library.** The Model Library dialog displays.



5. Select the **harrier_nlg** thumbnail.

This is a DXF file of a military aircraft

Any DXF files containing geographic coordinates can be placed at these coordinates by selecting Edit > use Model's Geographic Coordinates.

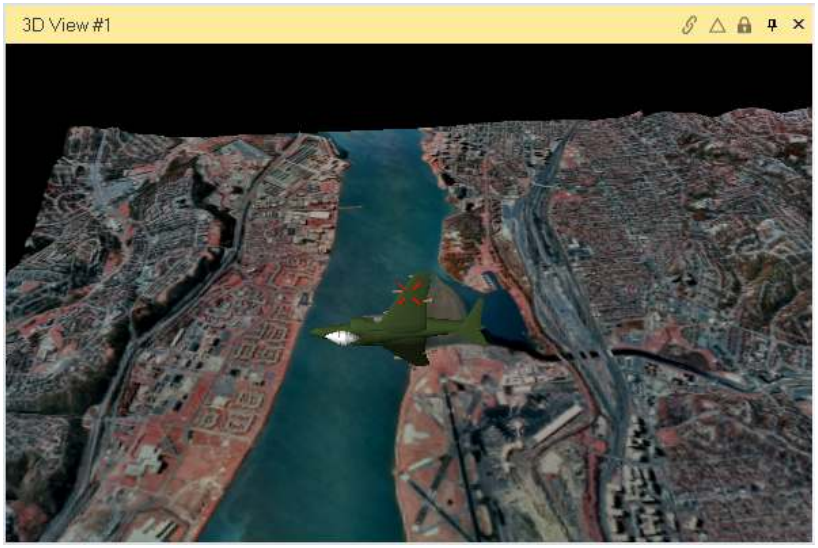
6. Click inside the **Model Overview** window. Using the **LMB** you can move the model up and down, forward and back. Using the **MMB** you can rotate the model.

This allows you to examine the model from every angle before you load it into your scene.

7. Click the **Import Selected Model** icon .

To add a new category and model into the Model Library create a new directory in the <IMAGINE_HOME>/etc/virtualmodels directory. The directory name will automatically appear as a new category. Any models or image feature placed into the new direcoty will show up as new models for selection.

8. **Close** the model library.
9. The 3D Model should appear directly ahead in the scene.



10. Change the **Navigation Mode** to **Selection.** Now you should be able to select and move the object.

11. By placing the cursor on the edges of the defining box, the cursor changes to  and you can tilt the object using **LMB.**

12. Select **Model > Model Attributes**  .

The Model Attributes Ddialog is used to manuall alter the size, position and rotation of the object.

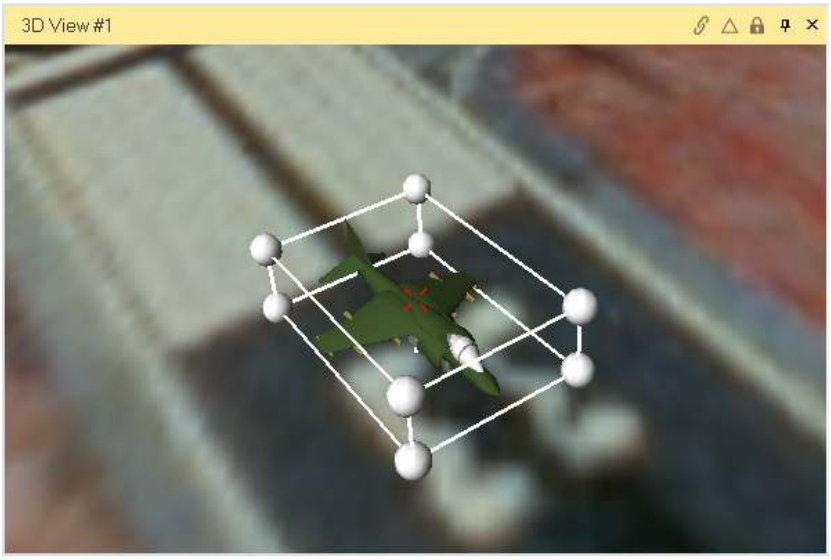
13. In the Model Attributes dialog, input the following parameters.

X:	323567	**Pitch:**	80
Y:	4302187	**Azimuth:**	152
AGL:	0.5	**Roll:**	-83
Length:	6.25		

14. To apply the changes to the model, click the **Update View** icon  .

The object willl most likely dissapear from your view.

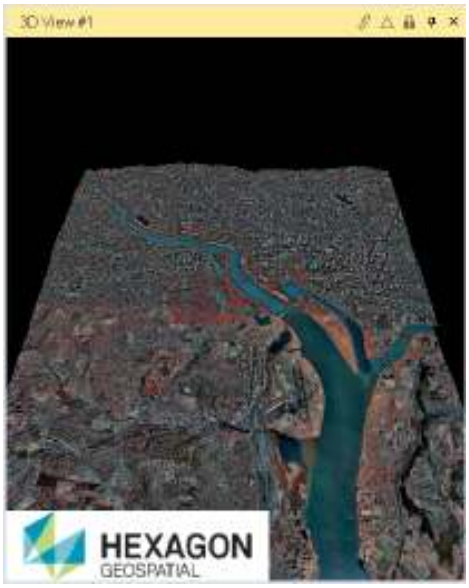
15. In the Model Attributes dialog, ensure that the **Model 1** row is selected and then select **Utility > Move to Selected model > Fly.**



16. Close the Model Attributes dialog.
17. To finish, click **File > Save > Top Layer.**
18. Additional models are available in the **Models** directory that can be added to the scene.
19. Leave the 3D View open for the next task.

Task 14: Create a New Logo Layer

1. From the VirtualGIS Menu bar, select **File > New > Logo Layer.**
2. Navigate to your Outputs directory and type ***hexgeo_logo.logo*** as the filename. Click **OK.**
3. A Logo menu has now been added to the Virtual GIS Menu bar.
4. Select the Logo tab and click **Add Image Logo**  **.**
5. In the Select Image dialog, change the **Files of Type** to **GIF** and then select ***hexgeo logo.gif.***



Logo images can also contain transparent portions that can be used as the foreground of your VirtualGIS scene, i.e. a cockpit view or a binocular view.

6. Navigate throughout the scene and note how the logo maintains its location
7. Change the **Navigation Mode** to **Selection.** Click on the logo in the VirtualGIS scene and move it throughout the window.
8. **LMB + Shift** the logo to change it's size.
9. Click **File > Save > Top Layer.**

Placing a logo in your scene is typically done prior to creating a VirtualGIS movie.

10. **RMB** on the logo layer in the Contents pane and select **Remove Layer**, in order to remove the logo layer from the scene.
11. Leave the 3D View open for the next task.

Task 15: Flight Path Editor

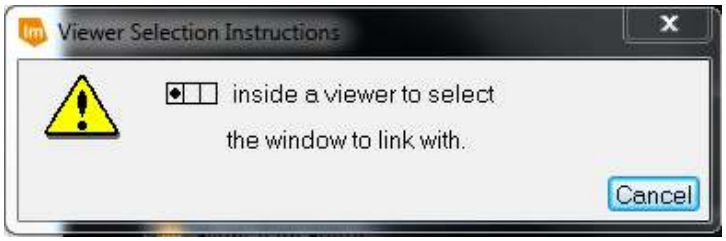
Flight paths are digitized in a standard or GLT Viewer and then loaded into the VirtualGIS Viewer.

1. To open a standard unlinked Viewer, select **Scene** tab > **Create Overview**  **> Create Unlinked Overview.**

2. From the **Scene** tab, select  **Navigation >**  **Flight Path Editor.**

3. Within the Flight Path Editor, click the **Digitize Flight Path** icon  .

   A Viewer Selection Instructions box displays.



4. Click inside the **2D View** to link it to the 3D View. When the pointer is placed over the standard Viewer, it becomes a crosshairs.

5. Click in the **2D Viewer** to digitize a number of points, defining a circle focused around the National Mall, then double-click to terminate the line.

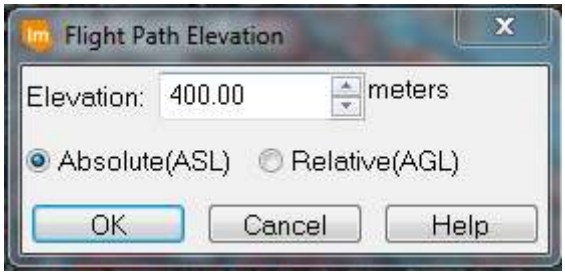
   A flight path line can take any form, but in this exercise a circular flight path is used. If nccesary, any of these points and line segments can be moved by using the LMB to grab and drag the point. Additional points can be added with a MMB click on the flight line.

6. Once you are satisfied with this line, **Close** the 2D View.

7. This generates a **Broken Link** message, Click **OK** to acknowledge the message.

We will now edit the height of the flight path.

8. Expand the **Flight Path Editor** dialog in order to view all columns.
9. From the Flight Path Editor menu, select **Edit > Set Elevation.** The Flight Path Elevation dialog displays.



10. Change the **Elevation** value to **400** meters, enable the **Absolute(ASL)** (Above Sea Level) radio button, then click **OK.**
11. Click the **Apply Changes to Flight Path** icon .

To apply these and any other changes to the flight path, the Apply Changes to Flight Path icon must be clicked.

We will now run the flight and set a focal point.

12. From the Flight Path Editor, click **Start Flight** icon .

What does the red triangle at bottom of this dialog indicate?

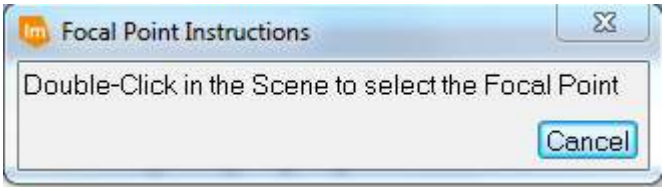
What happens if you click and drag the triangle along the line?

13. Change the **Look Pitch, Look, Azimuth** and **Speed** values and see what effect they have on the 3D scene. (You will need to click the **Apply** icon to see any changes made.)

Within the VirtualGIS Viewer, you will select a point that can be viewed continuously while flying along the flight path.

14. Change the **Navigation Mode** to **Position** and **Zoom to Data Extent**
15. In the Flight Editor, **RMB** click under the **Point#** column and choose **Select All.**

16. Select **Edit > Set Focal Point.**



17. You will be prompted to double-click in the VirtualGIS scene, in order to set this focal point. Double-click on the Lincoln Memorial model that was added previously.

18. Click **Apply Change to Flight Path** icon  .

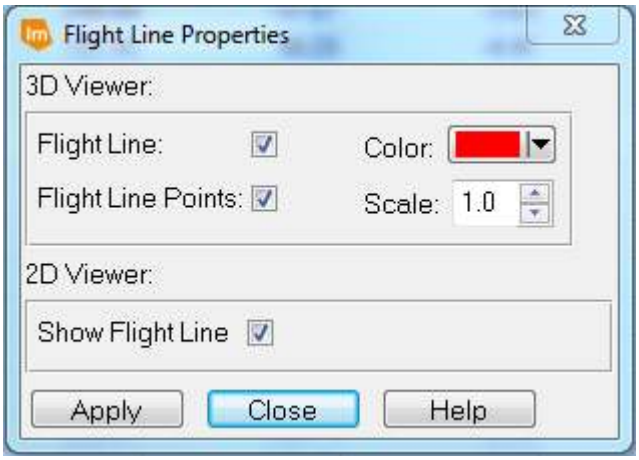
19. Click the **Start Flight** icon  .

What changes have been made to the values in the CellArray?

20. **RMB** under the **Point#** column and choose **Select None.**

We will now look at editing the flight path after it has been created.

21. From the Flight Path Editor menu, select **Utility > Flight Line Properties.**



22. Within the 3D Viewer group of the Flight Line Properties dialog, enable the **Flight Line** and the **Flight Line Points** checkboxes.

To see the digitized points in a 2D viewer, enable the Show Flight Line Checkbox.

23. Click **Apply** and **Close**. A line designating the flight path should now be visible in the VirtualGIS scene.

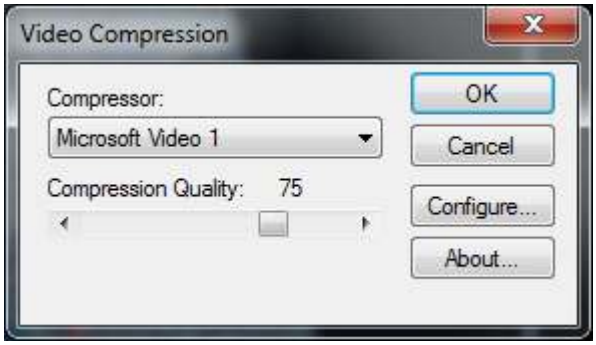
24. Return to the initial observer location by using **Fit to Frame**  **.**
25. To change the position of one of the points in the Flight Path, change the **Navigation Mode** to **Selection**. Click on one of the points in the flight path and you should be able to select it.

    If you are not able to select a specific point, then zoom in closer to that point and try selecting it again.

26. Click and hold the **LMB** to move this point within the scene, then hold **Shift** and move the pointer back and forth to decrease or increase the altitude.
27. Click the **Apply** icon  in the Flight Path Editor, and then click the **Start Flight** icon  .
28. Take a few minutes to adjust various flight points and parameters. You can also set new Focal Points for individual point or groups of points.
29. Once you are finished making changes to your flight path. In the Flight Path Editor select **File > Save As.**
30. Navigate to your **Outputs** directory and name the file **flight.flt**, press **Enter**, then click **OK** but do not close the Flight Path Editor.
31. In the Flight Path editor, select **Utility > Flight Line Properties** and disable **Line** and **Points.**
32. Click **Apply** and **Close**
33. Leave the Flight Path Editor and 3D View open for the next task.

Task 16: Start the Movie Recording Utility

1. From the Recording group on the Scene tab, click the **Start Recording** icon  . The Select Output Movie File dialog displays.
2. Click the **Files of Type** pull-down arrow and select **Microsoft AVI (*.avi)**.
3. In the **File Name** text box, type **3dmovie**, and press **Enter**.
4. Click the **Options** tab, ensure that the **Entire Flight Path** radio button is selected and then click **OK.** The Video Compression dialog is displayed.

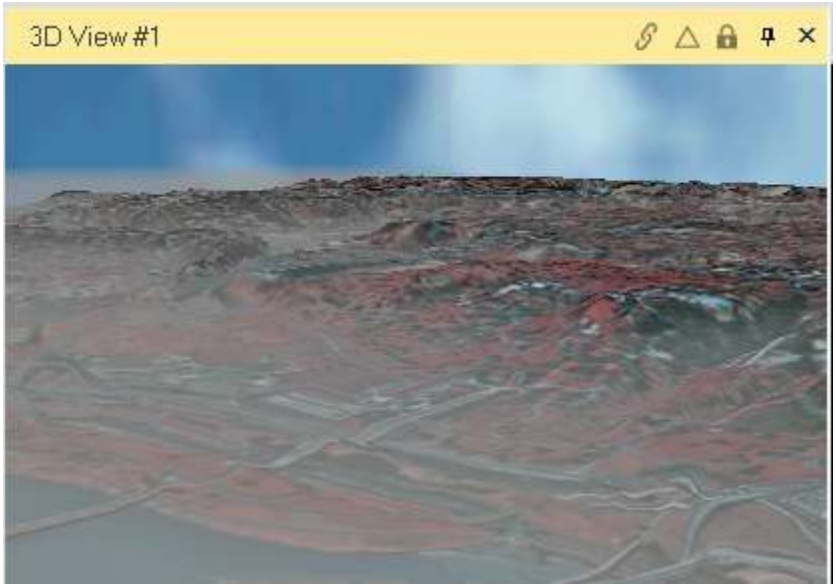


5. Click the **Compressor** pull-down arrow, select **Microsoft Video 1**, then click **OK**.
6. From the **Flight Path Editor**, click the **Start Flight** icon  .
7. When the **Message** dialog stating **Movie Complete** displays, click **OK.**
8. To run the **3dmovie.avi**, navigate to the outputs directory and open the file.
9. The ***.avi** will play back in Windows Media Player or the default media player you system uses.
10. When the movie is finished,**close** the movie player.
11. **Close** the Flight Path Editor.
12. Leave the 3D View open for the next task.

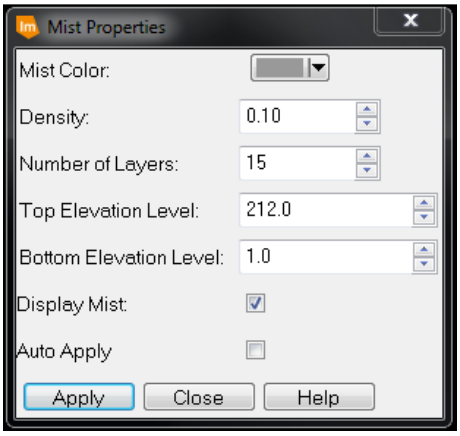
Task 17: Create a Mist Layer

1. From the ERDAS IMAGINE eWorkspace, select **File > New > Mist Layer**. The Create Mist Layer dialog appears.
2. Navigate to your Outputs directory and type **mist.fog** as the filename. Click **OK.**

The default color for the mist layer is gray, causing the layer to look like a smog layer. For some scenarios, this may be useful visualization technique. For this exercise, we will be changing the color of the layer, so that it more closely resembles a fog layer.



3. Select the Mist layer in the Contents pane.
4. On the **Mist** tab select  **Mist Properties**. The Mist Properties dialog appears.

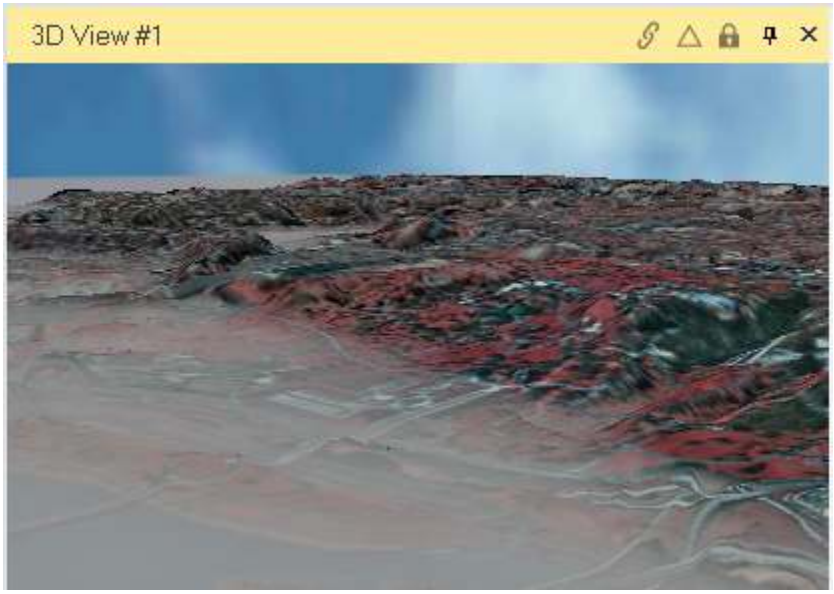


5. Enable the **Auto Apply** checkbox.
6. Change the **Mist Color** to **White** and the **Top Elevation Level** to **75.** This increases the opacity of the fog layer.
7. Change the **Number of Layers** to **25.**

The larger the number of layers, the more realistic it will appear. Twenty to twenty-five layers are sufficient to generate a realistic mist.

You can turn off the Mist layer by deselecting the Display Mist checkbox.

8. Click **Apply** and **Close**

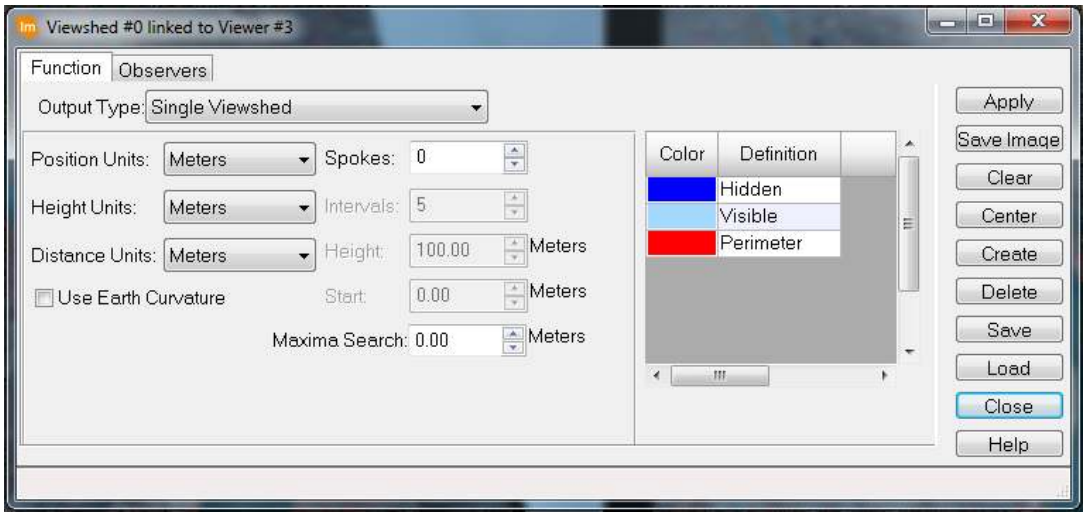


9. Navigate throughout the scene and examine how the mist layer affects visualization.
10. **RMB** on the mist layer in the Contents Pane and select **Remove Layer** to clear it from the scene. Click **No** to any save messages that appears
11. Leave the 3D View open for the next task.

Task 18: Open the Viewshed Module

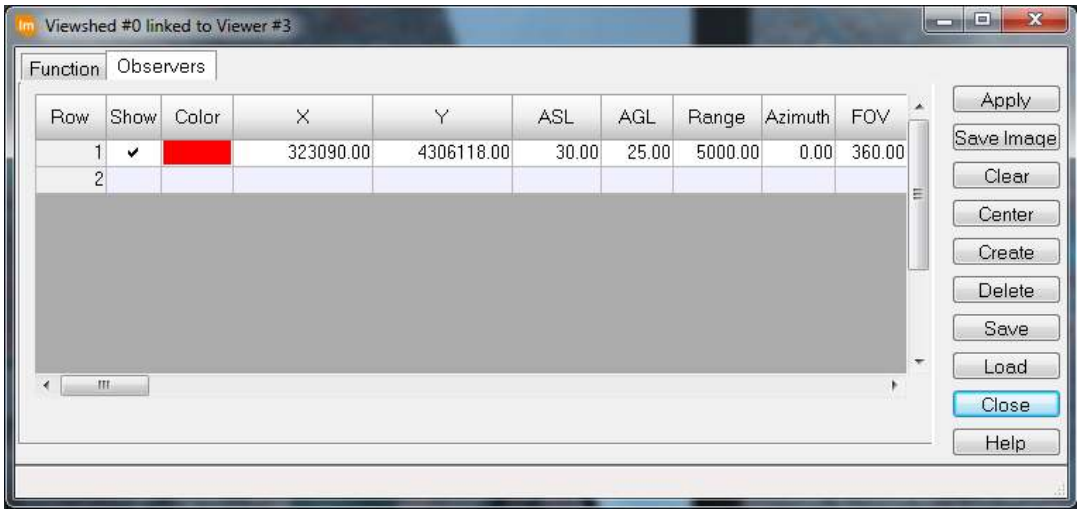
1. To use the Viewshed tool you will first need to display the DEM in an open Viewer. The fastest way to do this is to select **Scene** tab > **Create Overview**  **> Create Unlinked Overview.**

2. With the 2D View selected, change to the **Terrain** tab, then click **Viewshed**  . Click OK on any Warning dialogs. The Viewshed dialog displays. This dialog controls the Viewshed Generation Parameters.



In the Viewer, a red point identifief will display next to a number 1. This point marks the Observer's Position. Using the LMB, the tool can be grabbed and dragged to any location, or its corrdinates can be input manually in the Viewshed dialog.

3. In the Viewshed dialog, select the **Observers** tab



4. Change the following parameters:

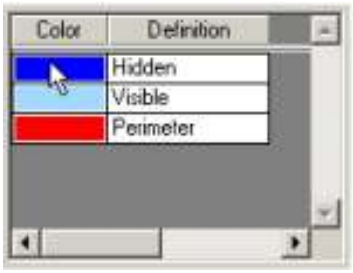
   X = **323090**

   Y = **4306118**

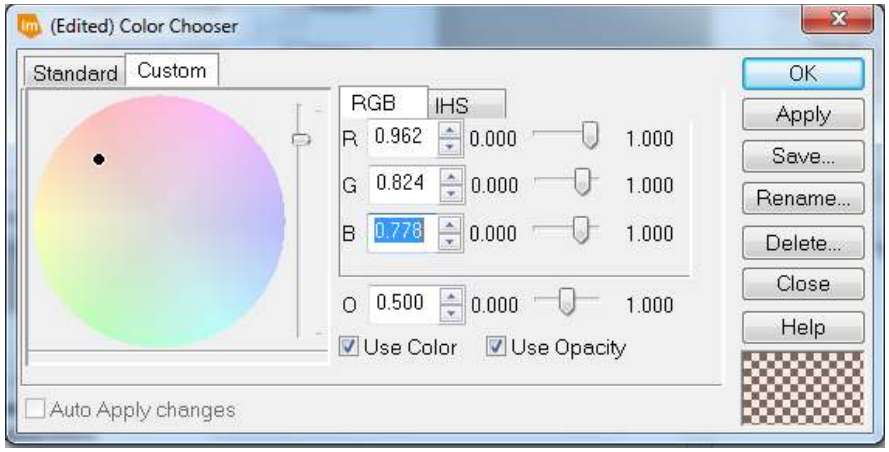
   ASL = **30**

   Range = **5000**

5. Click the **Function** tab
6. Click on the **Color** cell for the **Hidden** row, then select **Other.**



7. The Color Chooser dialog displays

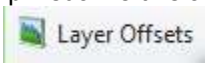


8. Grab and drag the **dot** within the **Custom** color wheel to select a pale **red** color
9. Enable the **Use Opacity** checkbox and change the **Opacity** to **0.5**
10. In the **Color Chooser,** click **Apply** and **Close**.Repeat the above steps and change the **Color** cell of the **Visible** row to **Green** and its **Opacity** to **0.5**.
11. Change the **Color** cell of the **Perimeter** row to **Black.**
12. Within the Viewshed dialog, click **Apply** and a new Viewshed Image is generated in the Viewer.

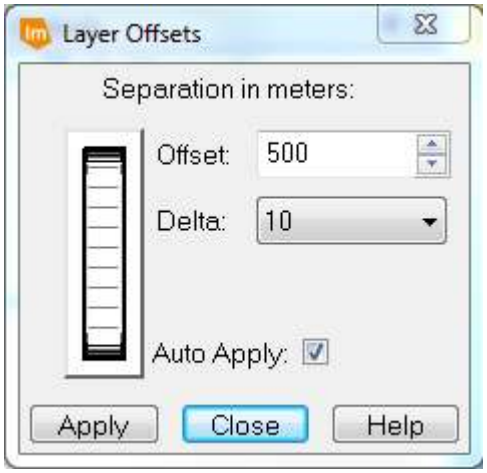
The green areas withiin this image are all visible from this observer point. The red areas are hidden from view.

13. In the Contents Pane, you will see that the Viewshed Operation creates a new Raster Layer with a temporary file name.
14. In the Viewshed dialog, click the **Save Image** button, navigate to the Outputs directory, type ***viewshed.img*** as the File name, and then click **OK.**

The Viewshed Layer is now draped within the 3D scene.

15. To help visualize this area, from the **Scene** tab, select **View > Layer Offsets** 

. The Layer Offsets dialog displays.



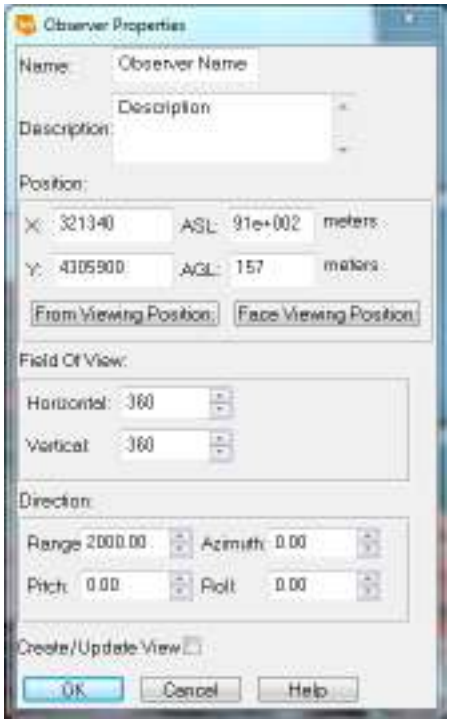
16. Enable the **Auto Apply** checkbox, then use the **dial** on the left to adjust the offset. You will see the layer rise above the terrain.
17. Reset the **Offset** value to **zero,** then click **Close** in the Layer Offsets dialog.
18. In the Contents Pane, **RMB** click on ***viewshed.img*** and select **Remove Layer.**
19. **Close** the 2D Viewer.
20. Leave the 3D View open for the next task.

Task 19: Insert an Observer

1. With the 3D View selected select **File > New > Intervisibility Layer**. In the Create Intervisibility Layer dialog, type ***intervis.vis*** in the File text box then click **OK.**

2. Select the Intervisibility layer in the Contents and then switch to the **Intervisibility** tab.

3. You will first add an Observer Location to your new layer. From the Intervisibility group select  **Add Observer.** The Observer Properties dialog displays.



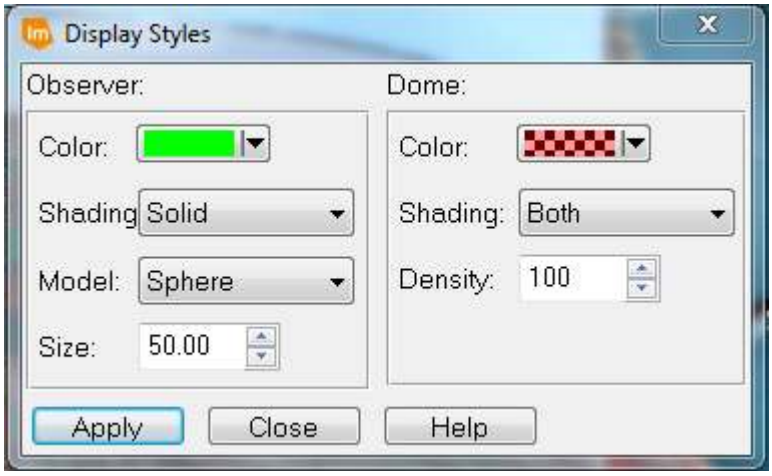
In the Observer Properties dialog, you can define the position, direction and size of the Intervisibility Dome.

4. Insert the following values, enable the **Create/Update View**, and then click **OK** to accept the other defaults.

- Position X: **321340**
- Position Y: **4305900**
- AGL: **15**
- Direction Range: **2000**

In the scene, an Observer Marker will display at the Observer Location.

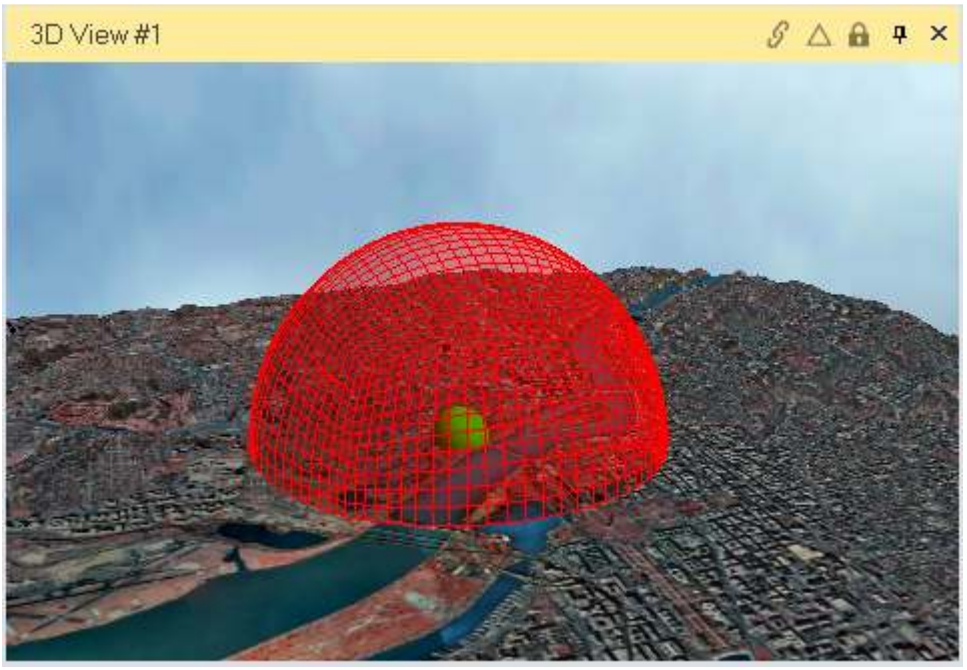
5. To alter the appearance of the Observer Marker, select **Intervisibility > Display Styles**  . The Display Styles dialog displays.



6. In the Observer Group options, change the **Size** value to **50,** click **Apply** and then click **Close.**

Where can you set a default observer size?

7. Select **Intervisbility > Create/Update View**  . The Intervisibility Dome displays. The dome reflects the line-of-sight from specified locations on the terrain.



Within the defined range, all the space within the dome is “visible” to the observer. Notice how the base of the dome rises above the ground, indicating areas in “shadow”.

8. Using the navigation tools, move in closer to the marker, and then change the **Navigation Mode** to **Selection.**

9. Click on the green marker and a bounding box will appear around it. You should now be able to click and drag the Observer Marker in the scene.

10. To decrease and increase its altitude, hold **Shift** and move the pointer back and forth.

*It is possible to lower the observer below the surface and out of site. If this happens, select **Intervisibility** tab **> Drop to Ground.***

Is there a quick method for lowering the observer to the ground?

11. To regenerate the Intervisibility Dome, select **Intervisibility > Create/Update View.**

12. To view the 2D aspect of the dome, select **intervisibility > Create 2D Viewshed**  .

13. Name your output viewshed ***observer.img*** and then load it back into the VirtualGIS Viewer.

14. Select ***observer.img*** in the Contents Pane, change to the **Table** tab, and **Show Attributes**  .

Row	Color	Red	Green	Blue	Opacity	Histogram
0		1	1	1	0	4766
1		0	0	0	1	1038
2		1	0	0	0.5	13171
3		0	1	0	0.5	765

15. Change the Opacity for **Class 2** and **3** (Hidden and Visible classes) to **0.5**. You can also change the class colors here.

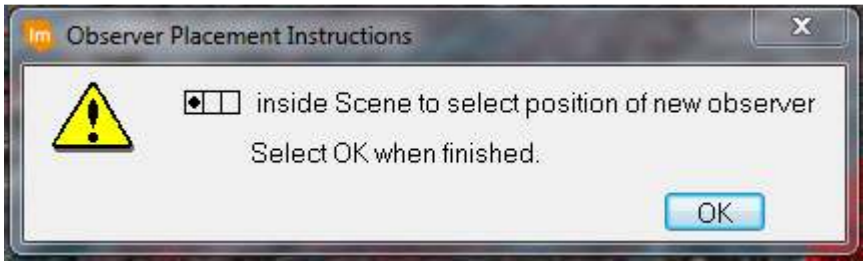
16. **Close** the Raster Attribute Editor and **save** changes.

Task 20: Add and Orient Other Observers

1. Reset the scene by using **Zoom to Data Extent**.

2. To add another observer, select the Intervisibility layer in the Contents Pane and change to the Intervisibility tab.

3. Click **Place Observer.**



4. In the scene, click where you wish to place the observer. A new marker should appear.

5. Click **OK** in the Observer Placement Instructions dialog.

6. Change the **Navigation Mode** to **Selection** and select the newly placed observer.

7. Select **Intervisibility > Display Styles** .

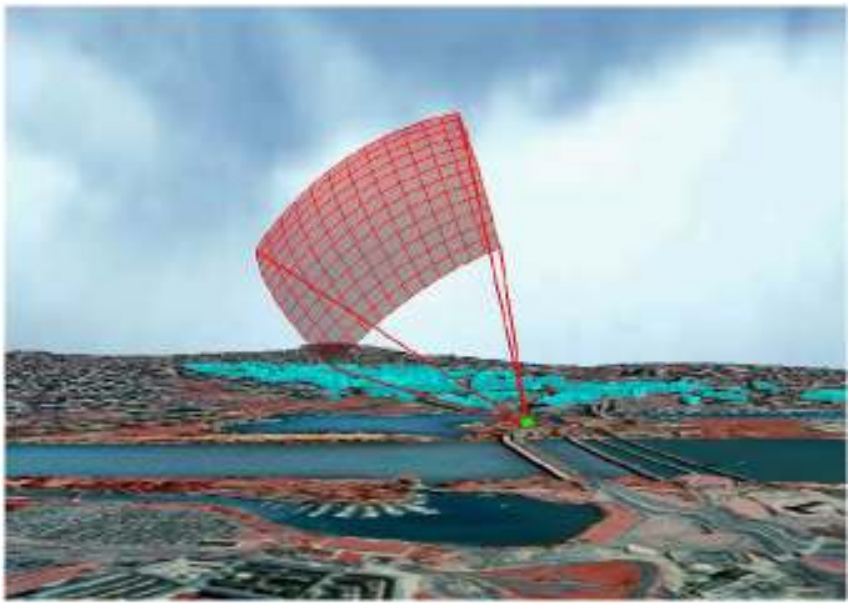
8. In the Observer group options, change the **Size** value to **50**, click **Apply** and then click **Close**.

9. Select **Intervisibility > Observer Attributes**

10. Ensure that **Observer 2** is selected. Select **Utility > Drop to Ground**.

In order to create a rather complicated intervisibility cone, the Observer Attributes dialog is used to change any of the parameters associated with each other.

11. Set the **AGL** of the new observer to **0**.
12. Set the **FOV X** and **FOV Y** to **40**.
13. Set the **Range** to **1000**, the **Pitch** to **40**, **Azimuth** to **0** and the **Roll** to **-50.**
14. Click the **Create/Update View** icon and then **Close** the Attributes dialog.



This type of cone is more suitable for directional RADAR and other observation or sensing devices.

Both extendended vector layers and 3D models interact with these intervisibility layers, so that buildings and other objects will cause shadows.

15. **RMB** click on ***intervis.ivs*** in the Contents Pane. Select Remove Layer. Be sure to save your changes.

Task 21: Animating Model with the Animation Tool

1. On the Scene tab, click **Create Overview**  **> Create Unlinked Overview.**

2. Select the **File > New > Model Layer**. The Create Model Layer dialog appears.

3. In the **Create Model Layer** box, type ***animation.vml*** as the name of the new model layer and then click OK.

4. Select animation.vml in the Contents Pane, then change to the **Model** tab. Click **Model Library**  .

5. From the **Aircraft** category select any of the available **models** and then click the **Import Selected Model** icon  .

6. In the Model Library select **File > Close.**

7. Open the **Model Attributes**  and adjust the following parameters:

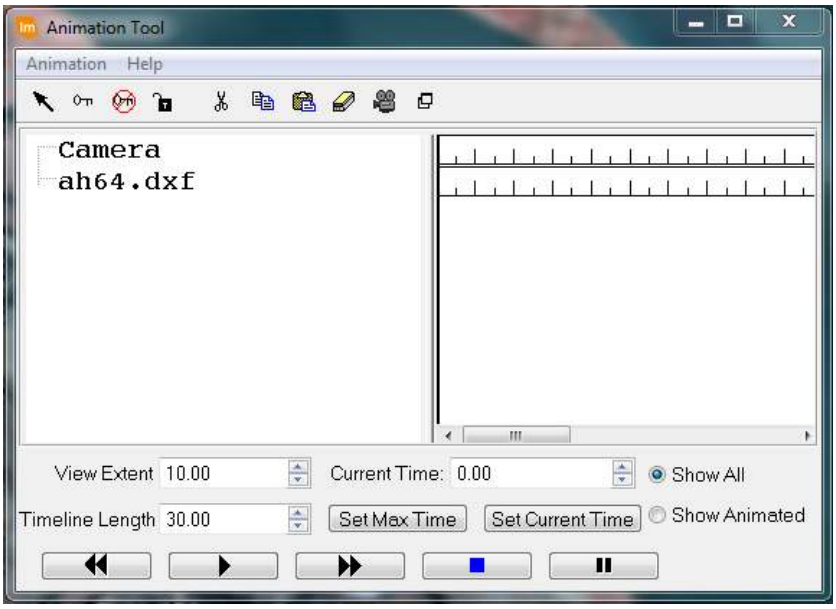
- Position X: 323197
- Position Y: 4301722
- AGL: 500
- Width: 500

8. Click the **Update View** icon  .

9. Select the **Model Row 1**. Once it is highlighted, select **Utility > Move To Selected Model > Fly.**

10. **RMB** under the Model column and choose **Select None** and then close the Model Attributes dialog.

11. On the **Scene** tab, select **Navigation > Animation Tool**  **.** The Animation Tool displays.



The Animation Tool contains two unique objects that can contain animation, the Camera (Viewer's Perspective) and the model that was just added to the scene.

12. Double-click inside the model timeframe. The Timeline Editor displays.

13. Click the **Position** tab.

Within this dialog, you could load a previously digitzed flight path using the Load Flightpath button. However, for this exercise you will be creating a new flightpath in the 2D Viewer.

14. Click the **In Viewer** button and follow the Viewer Selection Instructions to select the **2D Viewer**.

15. Click inside the 2D Viewer and start to digitize the model's flight path. Double-click to end the flight path.

16. In theTimeline Editor, enable the **Show 3D Path** checkbox.

This allows you to see the flight path in the VirtualGIS Viewer.

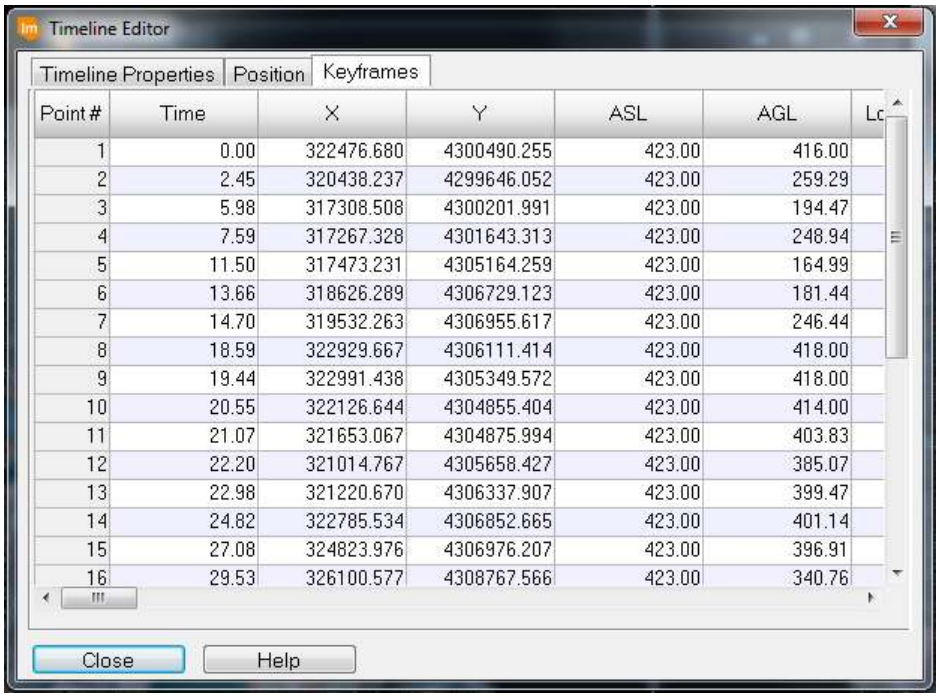
17.

18. Disable the **Show 3D Path** checkbox.

To edit the color or size of the Flight Line and Points, use the Display Properties button.

19. Click the **Keyframes** tab.

The CellArray that displays is the same as that found within the Flight Path Editor, except that a Time column has been added and the Speed column has been removed.



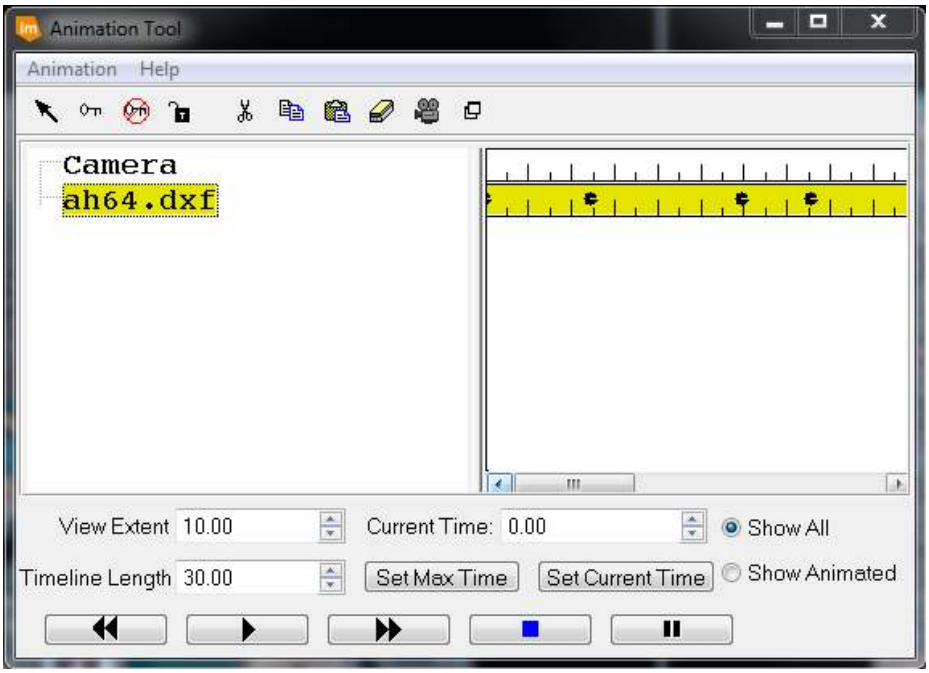
20. Click the **Timeline Properties** tab and then click the **Save Key-frames As button**

You will be using the same flight path for the camera and then adjusting the Time column slightly.

21. In the Save Keyframes dialog, type ***keyframes.atl*** as the output file name and then click **OK.**

22. **Close** the Timeline Editor.

23. In the Animation Tool, within the model's timelilne, dots appear indicating the time distance between the flight path points. (You may need to click the timeline for the dots to appear).



24. In the Animation Tool, click the **Play** button  .

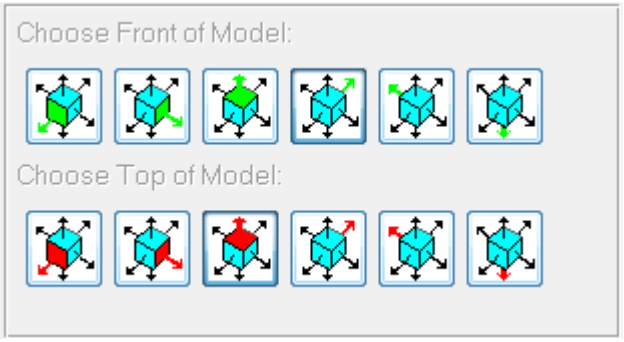
25. Click the **Stop** button  .

In case the model's orientation was incorrect during its flight, the next few steps will correct the orientation.

26. Change to **Selection** mode and select the model.

27. In the Model Attributes dialog, select **Utility > Model Properties**.

28. Enable the **Orientation** checkbox.



29. Using the **Front of Model** and **Top of Model** icons, adjust the orientation of the model until it is oriented correctly to its flight path.

30. **Close** the Model Properties dialog.

31. **Play** the model animation again to test the orientation changes.

Task 22: Animate a Model using the Animation Tool

The Model timeframe will be copied and applied to the camera timeframe (viewer perspective)

1. Double click inside the camera timeframe

2. Click the **Load Keyframes** button.

3. Within the Load Key Frames dialog, navigate to your Outputs directory and select ***keyframes.atl*** and then click **OK.**

4. Click the **Keyframes** tab.

The flight path that was digitized for the model has now been defined for the camera, as well. When you play the animation, the camera will appear to be inside of the model because they are moving at the same speed and along the same path.

5. In the Animation Tool, click the **Play** button  .

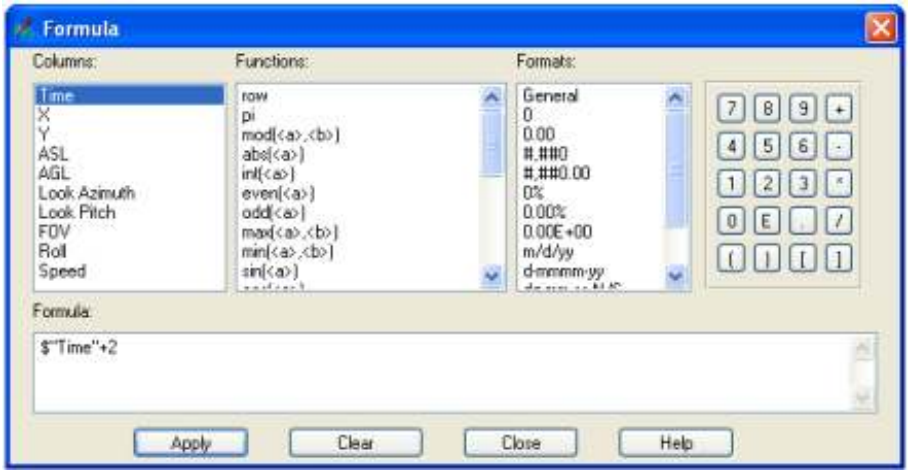
6. Click the **Stop** button  .

The timeline for the camera will now be adjusted so that it occurs a few seconds after the aircraft's motion.

7. In the Timeline Editor, click the **Time** column to highlight it.

8. **RMB** on the **Time** column heading and select **Formula.**

9. Input the following text into the **Formula** text box : **$"Time"+2**



10. Click Apply and Close.

This has added a two second delay to the timeline for the camera.

11. In the Animation Tool, click the **Play** button  .

The movement in the VirtualGIS Viewer should now display the aircraft slight in front of the camera's view.

12. Click the **Stop** button  .

13. In the Timeline Editor, click the **Position** tab.

The Position tab contains a Set of Focal Point button that allows you to set the camera's view to a specific point in the 3D scene. Additionally, you could turn the flight lines and points back on and adjust the height an location of a specific flight location.

14. Enable the **Show 3D Path** checkbox.

15. Adjust the flight line point do different locations and elevations.

Next, you will set the focal points to different locations and elevations.

16. Click the **Keyframes** tab.

17. **RMB** in the **Point #** column and choose **Select All.**

18. Click the **Position** tab and click the **Set Focal Point** button.

19. Follow the instructions to select a focal point in the scene.

20. Turn off the 3D Path and re-play the animation.

21. In the Timeline Editor, click **Close**.

22. In the Animation Tool, select **Animation > Close**.

Task 23: Animate a model using the Animation Tool

This is a challenge task to practice using the Animation Tool.

1. Use the techniques learned from a previous exercise and bring in multiple models.

2. Animate each model with its own flight path sequence.

3. **Clear** the Animation Layer from the 3D View.

Task 24: Import Model Coverage

1. On the Scene tab, click **Create Overview**  **> Create Unlinked Overview.**
2. In the 2D Viewer click the **Open Layer** icon  .
3. Change the **Files of type** to **Shapefile.**
4. From the **Shapefiles** folder, select ***trees_shapefile.shp*** and click **OK.**
5. With the Shapefile selected in the 2D View, change to the **Table** tab and select **Show Attributes**  . The Attributes dialog displays.

Record	AREA	PERIMETER	ID	COUNT	MIN_HEIGHT	MAX_HEIGHT	MODEL
1	71184.531	1798.796	8	50	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
2	59935.513	1403.393	9	50	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
3	643181.900	7412.613	17	200	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
4	379132.779	2513.893	65	2000	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
5	8568.436	394.665	7	100	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
6	24742.169	600.275	6	100	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
7	2630850.024	6214.291	255	2000	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img
8	1044211.294	9529.818	256	200	10	30	$IMAGINE_HOME\etc\virtualmodels\maturetrees\4acegri0.img

The information contained in this CellArray relates to tree species, density and height.

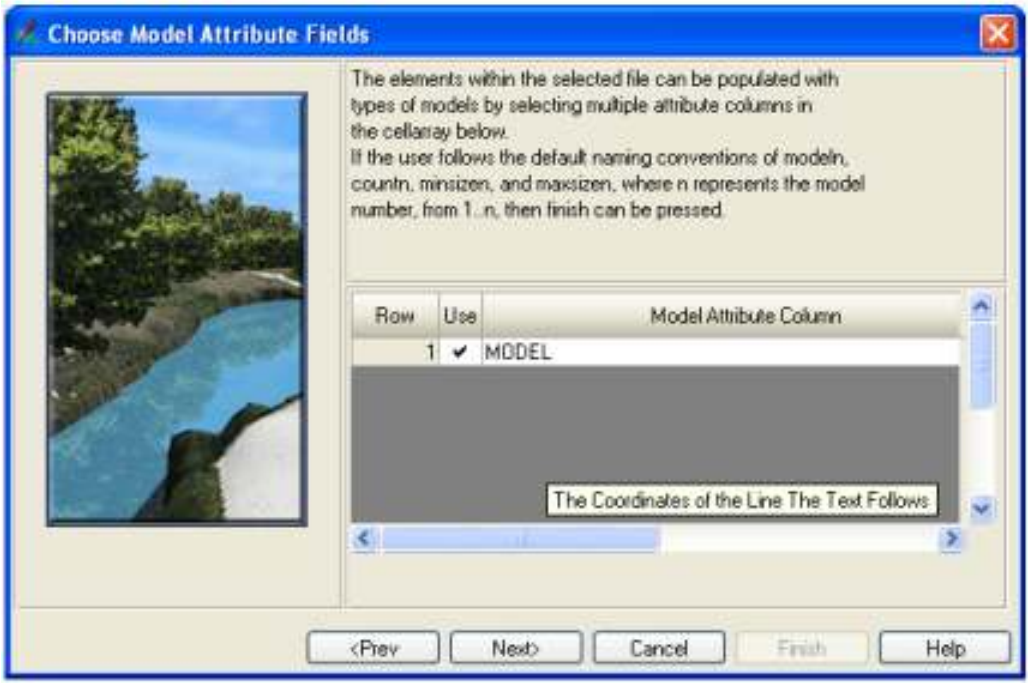
6. Compare the attribute information for each vector polygon to the image and then **close** the 2D Viewer.

   We will use the attribute information to populate the scene with the tree models of varying species, heights and densities.

7. From the 3D Viewer select **File > New > Model Layer**.
8. In the Create Model Layer dialog, type ***trees.vml*** for the file, then click **OK**. Select ***trees.vml*** in the Contents Pane.
9. On the **Model** tab select  **Import Model Coverage**. A 3D Model Wizard dialog displays.

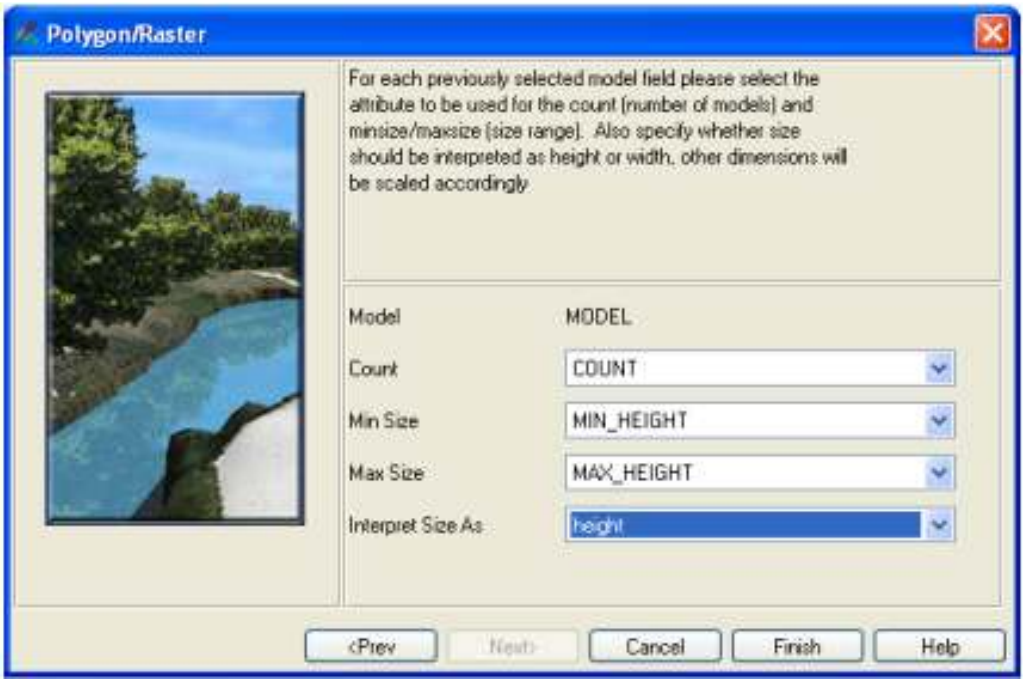
10. For the **Source File**, **RMB** click on the **Browse** icon , change the **Files of Type** to **Shapefile** and select ***trees_shapefile.shp*** then enable the **Polygon** checkbox.

11. Click **Next**. The Choose Model Attribute Fields dialog displays.



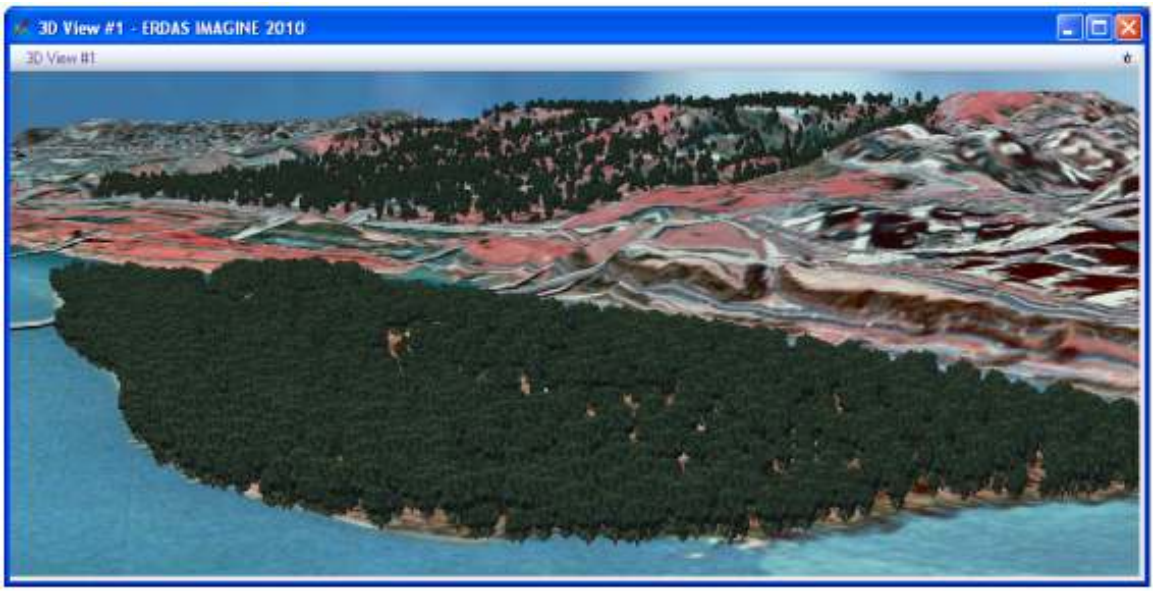
12. In the **Use** column, **Row 1**, place tick (**LMB** click), then click **Next.** The Polygon/Raster dialog now displays.

13. Change the parameters so that they match the dialog below.



- **Count** is the number of models and should be associated with the **Count** attribute.
- **Min Size** is the smallest model that should be placed in a polygon. The Min Size should be associated with **Min_Height**.
- **Max Size** is the largest model placed in that polygon. The Max Size should be associated with **Max_Height.**
- **Interpret Size As** specifies whether size should be interpreted as height, width or length and the other dimensions are scaled accordingly.

14. Once the parameters have been set, click **Finish**. This process will take a few minutes.
15. The scene will have models placed throughout each of the vector polygons. Take a moment to navigate the scene and view the trees of varying heights and densities.



16. From the Viewer, select **Model > Model Attributes**  **.** You could edit any model individually in this CellArray, if necessary.

    *You can exaggerate the size of the models to make them more obvious. In the Model Attributes select the Height Column, RMB click and select Formula. Enter $Height * 2 and click Apply*

    How many models are in you scene?

17. Close the **Model Attributes** dialog.
18. **RMB** on the model layer in the Contents Pane and select **Remove Layer**. When asked to save changes click **Yes.**

Task 25: Create a Vector Polygon file to Populate a Model Layer

1. Open ***mosaic.img*** in a 2D Viewer.
2. Select **File > New > Vector Layer.**
3. In the Create a New Vector Layer dialog change the **Files of Type** to **Shapefile (*.shp)** and name the layer ***trees.shp***. Click **OK.**
4. In the New Shapefile Layer Option, set the **Type** to **Polygon Shape** and click **OK.**
5. Zoom into the portion of the image that contains vegetated areas.
6. Select **trees.shp** in the Contents Pane.
7. In the **Insert Geometry** group on the **Drawing** tab, click the **Polygon** icon  .
8. Digitize a few polygons that contain vegetated areas..

   Next you will add the appropriate columns for this file to be used by the Import Model tool.

9. Change to the **Table** tab and select **Show Attributes**  .
10. In **Query** group, select **Column Properties**  **.**

You will be adding the following columns: COUNT, MIN_HEIGHT, MAX_HEIGHT and MODEL.

- **COUNT** – Indicates the number of models that will be imported into each polygon.
- **MIN_HEIGHT** – Indicates the smallest model size that will be present in each polygon.
- **MAX_HEIGHT** – Indicates the largest model size that will be present in each polygon.
- **MODEL** – Indicates the path and file where the model will be found.

11. Click the **New** button and type **COUNT** as the **Title**.
12. Change the **Type** to **Integer**.
13. Click the **New** button again and define the **MIN_HEIGHT** column as an **Integer** type.
14. Repeat the previous step to create the **MAX_HEIGHT** column.
15. To create the **MODEL** column, click the **New** button and change the **Type** to **String**.
16. Change the **Max. Width** and **Display Width** both to **100**.
17. Click **OK** in the Column Attributes dialog.
18. In the **COUNT** column manually edit each of the row so that each polygon has a different number of models that will be imported for it. Set your numbers to range from **50-1000**.
19. Click on the **MIN_HEIGHT** column to selelct it. **RMB** and select **Formula.**

20. In the **Formula** textbox, type **5**.
21. Click **Apply** and **Close**.
22. Repeat the previous stepps to set the **MAX_HEIGHT** to **20**.
23. Click on the **MODEL** column to select it. **RMB** and selec
24. In the Formula text, type: “<path>/tree.tif”

    The <path> indicates the location of the model file. (e.g. “c:/training/defense/virtualgis/tree.tif”)

25. Click **Apply** and **Close**.
26. **Close** the Vector Attributes**.**
27. Click the **Save Top Layer** icon  .
28. In the 3D View, create a new model layer.
29. Select **Model > Import Model Coverage**. Use the steps from the previous task to navigate through the Model Import Wizard.
30. Navigate through your scene to view the models that have been imported.
31. **Close** the 3D View and any open Viewers or dialogs.

Class Notes