

Use of Aerial Photographs from Internet Sources for HVE-2D Environment

R. Torrey Roberts, P.E., FDJ Engineering

Dave L. Jakovac, P.E., FDJ Engineering

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ABSTRACT

There are multiple aerial photograph sources on the internet that contain high quality images capable of being successfully imported into HVE-2D and used for environment backgrounds. This paper will discuss a process that can be quickly utilized to import aerial photographs into HVE-2D to create accident simulation environments. Software required includes HVE/HVE-2D, a PDF editor with dimension feature, Microsoft Word, and Internet Explorer or other browser. The imported aerial photographs need to be scaled to on-site tangible dimensions with a PDF editor before being used as an environment. Site diagram information can be added to the aerial photograph with the PDF editor before importing to HVE. The aerial photograph can then be saved as a .tif file, and imported into the HVE environmental editor as an object texture on a slab of the same dimensions as the scaled aerial photograph. Camera and vehicle positions can then be manipulated in HVE without change of environment scale. This paper will discuss this process in detail and provide examples of imported HVE environments.

INTRODUCTION

Presentation of accident reconstruction findings in an intuitive and accurate manner is a critical element of case investigations. Results must be understood by a wide variety of audience members, with differing degrees of technical backgrounds. The use of aerial photographs for accident scene diagrams and simulations can assist in providing accurate and intuitive presentation of results. There are aerial photographs available on the internet in abundance.

The purpose of this paper is to provide a method of extracting aerial photographs from internet sources such as Google Earth, Google Maps, Microsoft Bing, etc. and using them for accident scene environment backgrounds in HVE-2D. This process has been utilized successfully numerous times by FDJ Engineering for accident reconstruction.

The author(s) have chosen this method due to the relatively simple process for the user and availability of software. There are many other methods that could be used and software packages incorporated to accomplish the similar results.

This paper assumes the user has a general knowledge of PC operation running Windows OS Vista or 7 and HVE-2D.

SOFTWARE AND HARDWARE REQUIREMENTS

It is recommended that a computer with good graphic handling capabilities be utilized. Most modern desktops and laptops built within the last 3 years should be sufficient. Older computers will not have the needed screen resolution or processing capabilities for this process. Software required is as follows:

- Internet Explorer or other internet browser
- PDF Editor such as Adobe or PDF Professional with dimension feature
- Graphic Editor Software (Optional)
- Google Sketchup (Optional)
- Microsoft Word
- HVE/HVE-2D (Version 7.1)

PROCESS

Source of Aerial Photograph

High quality aerial photographs can be obtained from several internet sources. Aerial photograph image resolution is typically better near populated areas from most internet sources. It is sometimes difficult to obtain high quality aerial photography for areas of low population density from internet sources. Therefore, in more rural areas, other methods for site diagrams may need to be used such as AutoCAD, or an aerial photographer hired to take a site specified photograph. A list of internet sources that can be used to obtain aerial photographs are as outlined below:

- Google Earth (www.earth.google.com)
- Google Map (www.google.com/maps)
- Microsoft Bing (www.bing.com/maps)
- Map Quest (www.mapquest.com)
- Map Blast (www.mapblast.com)

Each source should be checked to determine where the best quality aerial photograph can be obtained before starting the extraction procedure.

Extracting Aerial Photographs

Several methods could be utilized for extraction of the aerial photograph from the source. With Google Earth the image can simply be saved to a JPG file. With internet sources, it is recommended that a CTRL+ALT+PRT SCR command be utilized to capture the aerial photograph. This paper will outline the process utilizing the CTRL+ALT+PRT SCR command with Google Maps. The process will be similar with other aerial photograph sources with minor modifications. Using this method will provide aerial photographs with resolution based on the screen resolution of the monitor in use. A higher resolution monitor will provide higher resolution images using the screen capture function (i.e. CTRL+ALT+PRT SCR).

The preferred internet browser software should be opened and directed to www.google.com. From the Google home page the maps link can be accessed

near the upper left hand corner of the screen as shown in Figure 1.



Figure 1 - Google Maps

For this example the intersection of Cole Rd. and Wilshire in Boise, ID will be used. Search the Google maps website for the desired location as shown in Figure 2. Enter the desired street address and city and select Search Maps.

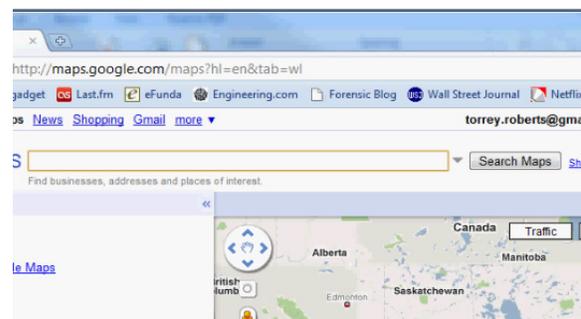


Figure 2 - Search Google Maps

The view should be changed from map to satellite and street labels should now be turned off so that a clear view of the street is provided. Select the Satellite button to show satellite imagery as shown in Figure 3.

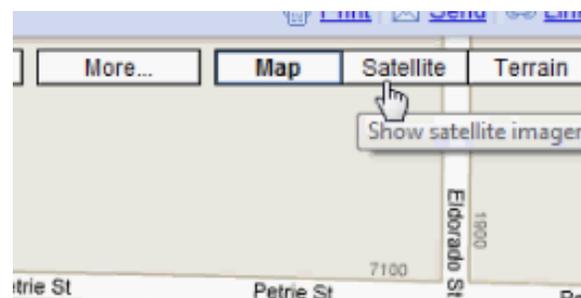


Figure 3 - Select Satellite Button

Turn off the street labels by selecting the Show labels check box below the Satellite tab as shown in Figure 4. The check mark inside the box should be removed so the street labels will no longer be shown.



Figure 4 - Turn off Street Labels

Maximize the browser window to capture the maximum screen area of the aerial photograph as shown in Figure 5.

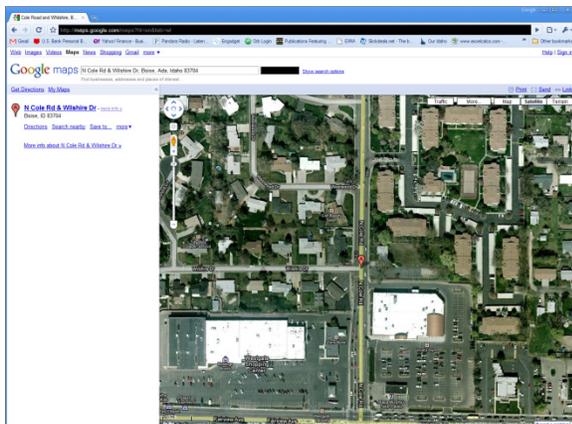


Figure 5 - Google Maps with Aerial Photograph

The screen can now be captured by clicking on the top bar of the window and pressing CTRL+ALT+PRT SCR. The image has now been stored on the clipboard, and can be pasted into a MS Word document as outlined below.

MS Word can now be opened. The page layout tab should then be selected as shown in Figure 6.

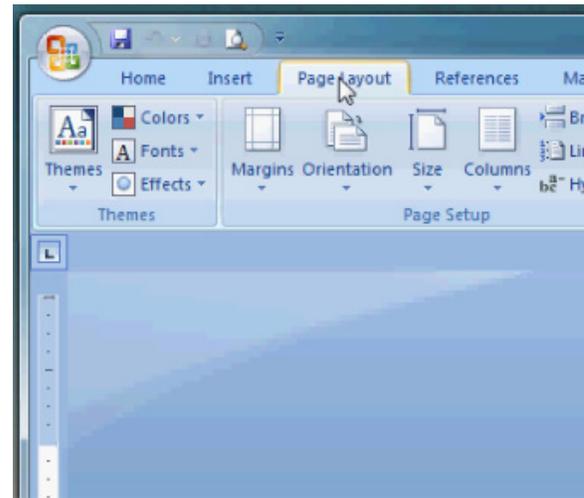


Figure 6 - MS Word Select Page Layout Tab

After accessing the page layout tab, it is recommended that the Paper Size be set to 11"x17" and the orientation set to Landscape as shown in Figure 7.

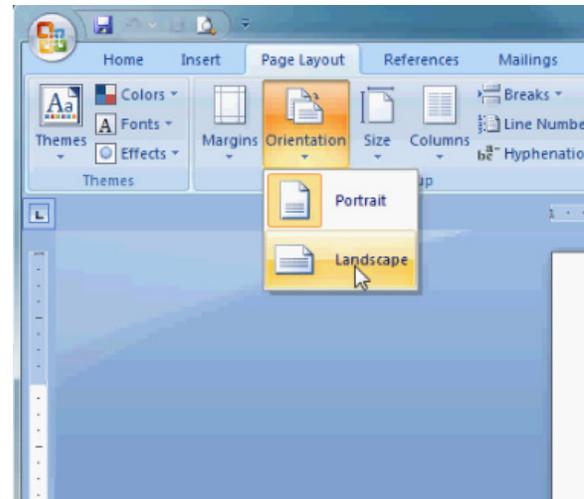


Figure 7 - MS Word Change Layout

This is for ease of printing a scene diagram later on. Most modern computers have wide screens, and screen captures from such screens will fit better on an 11"x17" page layout.

The screen captured image can now be pasted into MS Word document and edges cropped so that only the image area desired is remaining. The image

should be re-sized to fit the margin boundaries of the document as shown in Figure 8. Care should be taken to not change the aspect ratio of the image during re-sizing, as this will cause the photo scale to be incorrect.

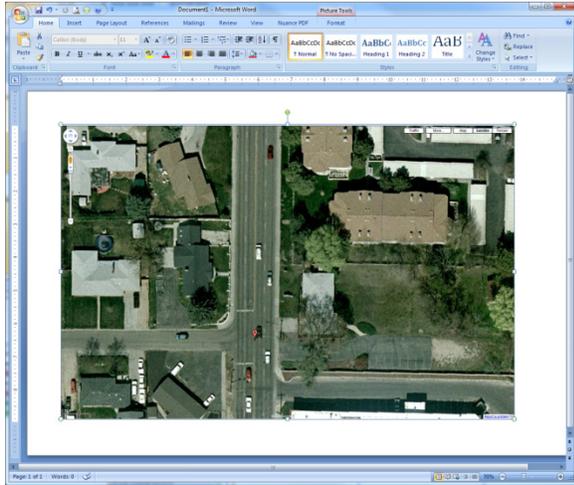


Figure 8 - MS Word with Aerial Photograph after Cropping

After the image has been pasted into MS word, cropped, and re-sized, it can be exported to the PDF editor for site diagramming and scaling of photograph. The PDF editor can now be opened and prepared for importing the aerial photograph. PDF Professional by Nuance has been used for this example; however there are multiple pdf programs that can be used. Regardless of what PDF program is ultimately chosen, it must have drawing and dimension capabilities. Alternatives to PDF programs, such as Google Sketchup can also be utilized, however this paper will only discuss the PDF Professional software.

The chosen PDF software can now be opened, for PDF Professional software, select the New PDF button after opening the software.

Select the Blank PDF option from the drop down menu as shown in Figure 9. A Custom Page Size dialog box will open.

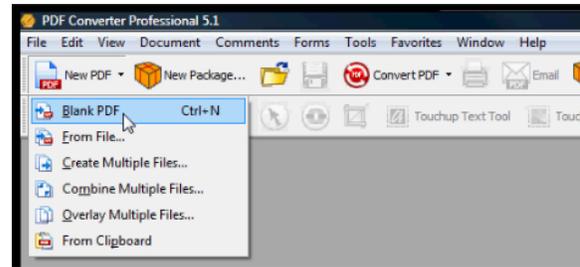


Figure 9 - PDF Editor Select Blank PDF

The recommended size for the new blank PDF is 11x17 to match the wide screen aspect ratio of the aerial photograph. Select Tabloid from the Page Size Name drop down list and select the landscape orientation as shown in Figure 10.

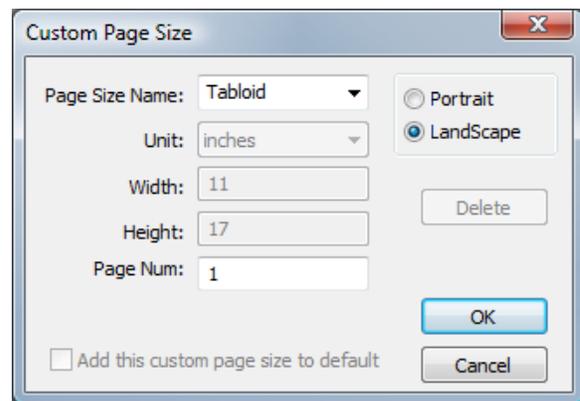


Figure 10 - PDF Editor Page Size and Orientation

Select OK, an 11"x17" white space will be shown in the PDF Professional Software.

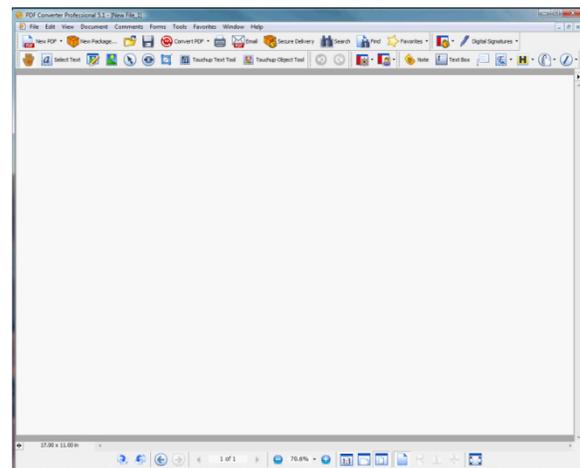


Figure 11 - PDF Editor with 11"x17" White Space

The PDF editor is now ready for importing the aerial photograph that was saved as a MS word file earlier. Open the MS Word file with the aerial photograph and right click on the aerial photograph. Select the Copy option from the list as shown in Figure 12.

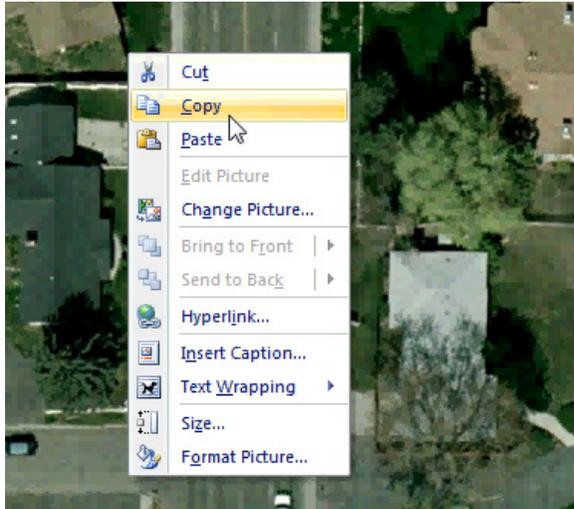


Figure 12 - MS Word Copy Aerial Photograph

Open the PDF editor, select Edit from the menu, and select Paste from the drop down menu as shown in Figure 13. The aerial photograph will be pasted into the PDF editor, but must now be relocated.

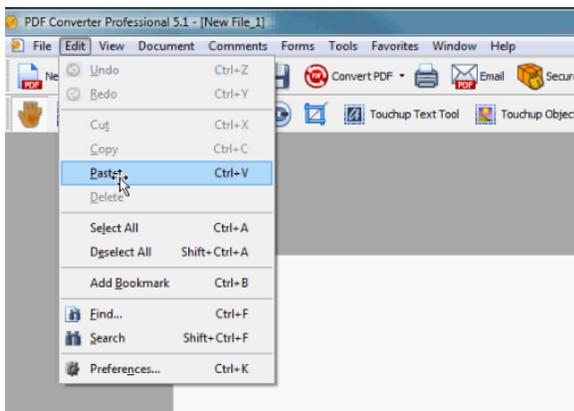


Figure 13 - PDF Editor Paste Aerial Photograph

Select the aerial photo and move it to the center of the white space as shown in Figure 14. After moving the aerial photograph, it should be protected so it does not get accidentally relocated or the aspect ratio distorted.

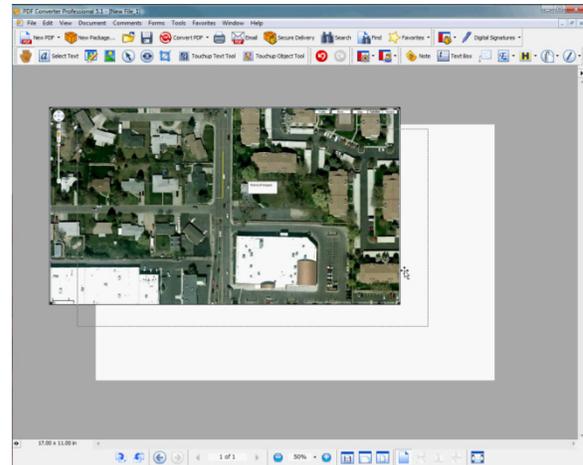


Figure 14 - PDF Editor Position Aerial Photograph

To protect the aerial photograph, right click on it and select Properties as shown in Figure 15.



Figure 15 - PDF Editor Aerial Photograph Properties

In the properties dialog box, select the Protected check box as shown in Figure 16. A check mark will appear in the check box. Select the Close button.

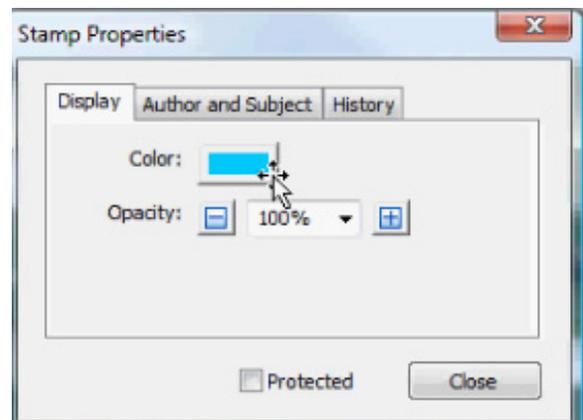


Figure 16 - PDF Editor Protect Aerial Photograph

The aerial photograph has now been successfully imported into the PDF editor, relocated, and protected. The main purpose of using a PDF editor is to apply a scale to the aerial photograph and draw accident scene information if desired.

The PDF file containing the aerial photograph should now be saved in the location of the user's choice. The drawing scale can now be determined which will be later used in the HVE environment setup process. In addition, accident information can also be drawing over the aerial photograph using the PDF editor.

In order to apply a correct scale to the aerial photograph, on site measurements of the distance between two visible objects in the aerial photograph must be known. The measurement of the distance between the two objects can then be taken in the PDF editor, and the scale adjusted until the distance measurement in the PDF editor and the site measurements are the same.

In the PDF editor with the aerial photograph file open, click on Tools, scroll to Measuring, and click on the Distance Tool option as shown in Figure 17. The distance tool will allow the user to take measurements inside the PDF program; however a correct scale must first be applied. It is recommended that the scale be checked with at least two reliable on-site measurements to insure accuracy.

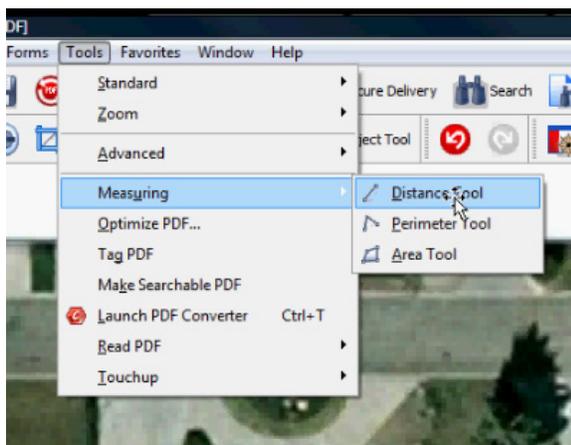


Figure 17 - PDF Editor Distance Tool

The Distance Tool dialog box will now open. To adjust the scale the user should select the Settings tab as shown in Figure 18.

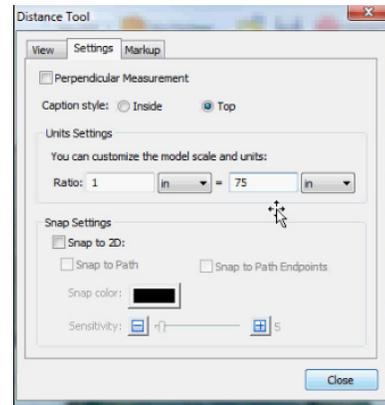


Figure 18 - PDF Editor Distance Tool

The correct scale can be determined via site measurements. The measurement between the on-site objects should be checked after adjusting the drawing scale. This can be accomplished by clicking on the drawing at one of the objects and running a dimension to the other object. This must be done with the Distance Tool dialog box open.

It is also recommended that the zoom in function be used when taking dimensions so that the dimension is accurately placed. After checking the dimension between the on-site measured objects, adjust the scale as required and re-check the distance measurement as shown in Figure 19..

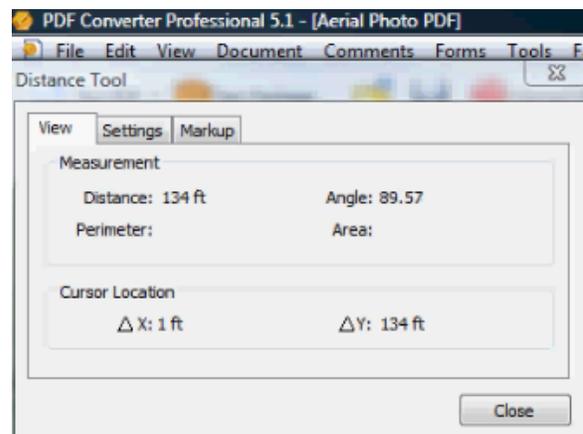


Figure 19 - PDF Editor Distance Tool

After the correct scale has been determined, a dimension of the entire drawing must be taken, this will be used for importing the aerial photograph into HVE. The dimension should be taken from the corners of the white space, not the aerial photograph. When the PDF file is saved as a .tif, the PDF editor will capture the area in the white space, which will later be imported into HVE. This dimension should be written down, or placed on the drawing. To place a dimension on the drawing, select the Dimension Tool, Markup tab, and select the Use Markup checkbox as shown in Figure 20.

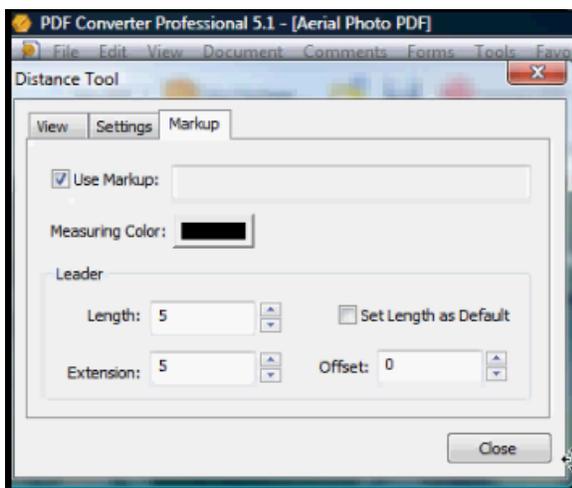


Figure 20 - PDF Editor Markup Setting

With the dimension dialog box open, the user should take dimensions of the length and width of the white space edges in the PDF editor. The dimensions taken should be placed in the white space and will be recorded on the PDF. They should be kept on the PDF for future reference, as they will be used for the HVE importing process.

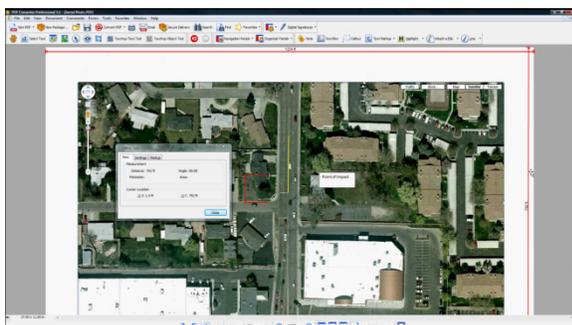


Figure 21 - PDF Editor with Page Dimensions

The PDF file can now be saved in PDF format and must also be saved as a .tif photograph for importing into HVE. To save the PDF as a .tif file format, go to the File drop down menu and select the Save As option as shown in Figure 22.

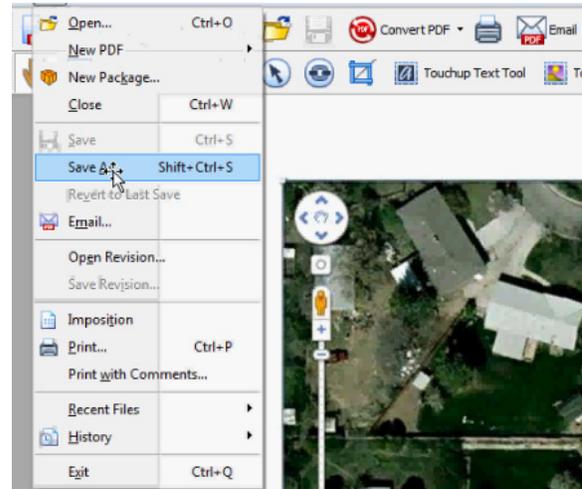


Figure 22 - PDF Editor Save-As

In the Save As dialog box click on the File Type drop down box and select .tif as the file type as shown in Figure 23.

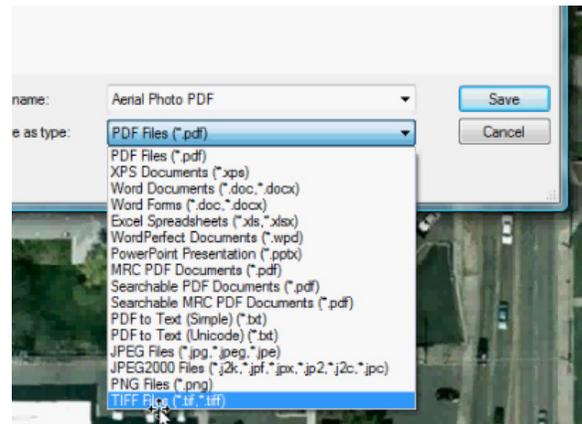


Figure 23 - PDF Editor Save-As .tif

Save the .tif file in a location of choice. The HVE-2D program can now be opened. Note that HVE-2D version 7.1 or later is required. After opening the HVE-2D program, the Environment button should be selected as shown in Figure 24.

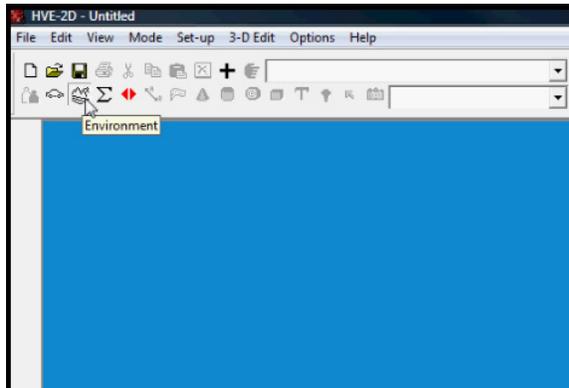


Figure 24 - HVE Select the Environment Button

After selecting the Environment button, the user should create a new environment by selecting the Add New Object button (plus symbol) on the toolbar as shown in Figure 25. Note that the newest version of HVE-2D, Version 7.1, is required for this part of the process.

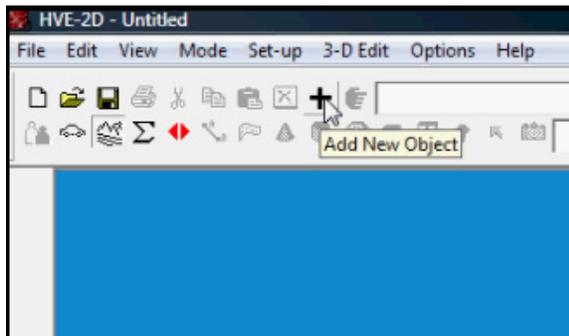


Figure 25 - HVE Select Add New Object

Set the environment parameters as required for the specific case. Under the File Type drop down menu select Aerial Photo and select the Open button as shown in Figure 26.

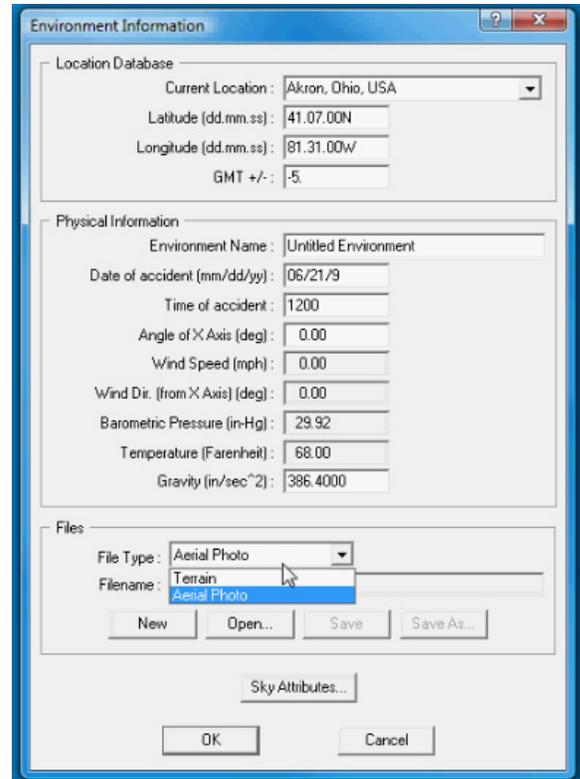


Figure 26 - HVE Environment Information

Browse to the location where the aerial photograph .tif file was previously saved as shown in Figure 27.

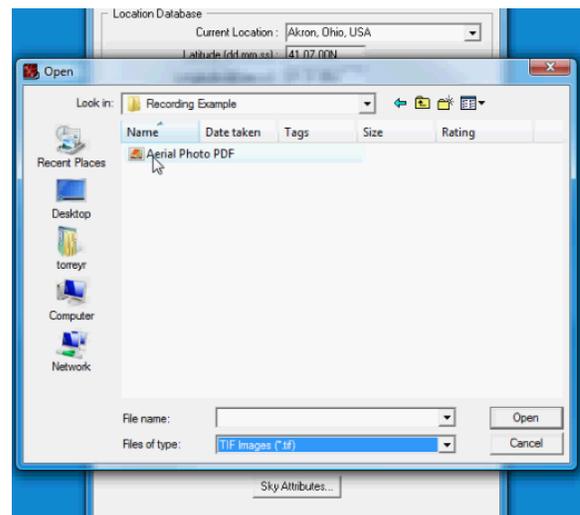


Figure 27 - HVE Open .tif File

Select .tif from the file type drop down menu and open the saved aerial photograph. An Image Coordinates dialog box will appear after opening the aerial photograph as shown in Figure 28. Dimensions that were previously determined in the PDF editor are entered here. For example if we measured a X-direction of 1200', we would enter -600' in the Upper Left X and 600' in the Lower Right X box, which provide a total length of 1200'. The procedure is similar for the Y direction. HVE will automatically import the aerial photograph into the environment background and scale it based upon the entered dimensions in the dialog box.

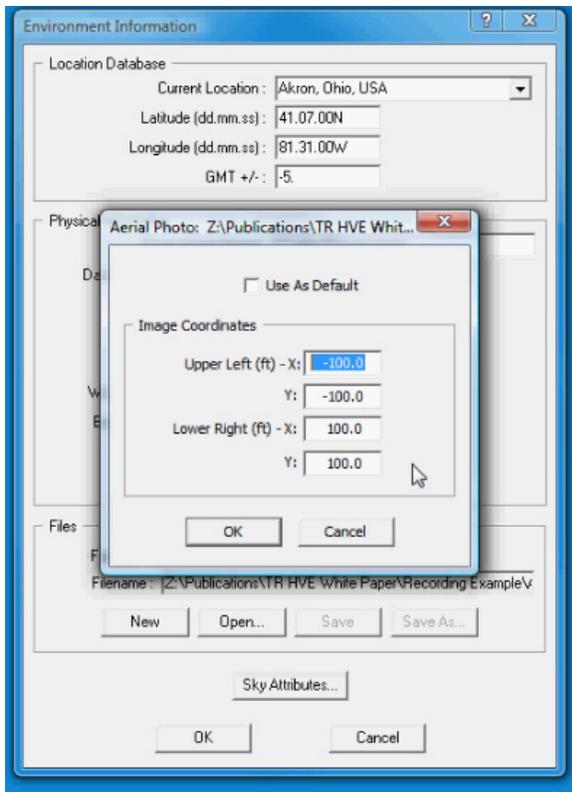


Figure 28 - HVE Aerial Photograph Size

Select the OK button and HVE will automatically import the aerial photograph into the environment background at the correct scale. The event editor can now be used to re-create the accident over the aerial photograph.

SUMMARY

There are several methods that could be used to import aerial photography from internet sources into HVE-2D to be used as scaled 2D environment backgrounds. The author has chosen to use the method described above because of its relative simplicity and availability of software at a low cost to the user. This method can be used quickly and effectively to create an environment background in HVE-2D. This allows the user to start running HVE simulations. More detail can be later added to the environment and it easily can be updated in HVE. Furthermore, 3D objects can be added to the environment using the HVE environment editor.

This process can also be coupled with more advanced software, such as AutoCAD to create detailed scene diagrams. Furthermore, free internet software, such as Google Sketchup, can also be used for obtaining aerial photographs and scene diagramming.

REFERENCES

- 2007 Microsoft Word
- PDF Professional 5.1
- HVE/HVE-2D 7.1
- www.google.com/maps