



## Tools for Asset Repair by PEV

Image by Alberte Zato

### **AttachmentMaker** a new tool from PEV

**A way to quickly and accurately add attachments to any asset.**

#### **Introduction.**

Some Trainz users wish to add attachment points to existing assets for their own use or, with permission of the original creator, make some additions to his asset for sharing with others.

A well proven way to add attachments involves making a another mesh in GMax/3dsMax or Blender with what ever attachments are needed along with an invisible object to allow the mesh to export out of the modelling program. This method is a bit hit or miss because there is no way to get the original model into the modelling program so that the attachments can be positioned relative to the shape of the parent object.

Attachments are easily added to meshes directly, but again no visual reference is provided to know where to place the attachments. And of course Auran's policy of not allowing users to mess with their meshes also needs to be adhered to. Auran's TrainzMeshImporter is specifically written to allow meshes from a variety of sources to be safely imported into the game, and in this case it provides the necessary conversion between the attachment data and an IM mesh for Trainz.

GMax and other modelling programs provide neat multiple views of an object in wire frame mode that allow attachments to be positioned within a model. It seemed logical that if we could directly make a multi view display of a mesh we could add attachments quickly and accurately.

So I set to work to make a program that gives front, side, and top views in wire frame mode, with all views zoomable and moveable.

The resulting Attachment Maker program provides views that are linked so that the relationship between them always maintains third angle projection; meaning the details are always aligned view to view. You will understand the significance of this once you start to use the program.

The views are the standard third angle projection, with the plan (top) view being above the front view, and the side view to the right. Those of you with drafting experience

should identify with this layout.

I think I have created a really simple tool that will make adding attachments a snap. Users will need to be able to read an engineering drawing, and be able to visualise a 3d object from the three basic views. Other than that virtually no drafting skills are needed.

#### **Using Attachment Maker.**

##### **Installation.**

The program is available for free download from my PEVSoft Download page.

<http://www.members.optusnet.com.au/~villamp/pevsoft.htm>

Run the installer and the program will be loaded on to the Program Files area of your C: drive, along with a desktop icon and an entry in the PEVSoft folder of your All Programs menu.

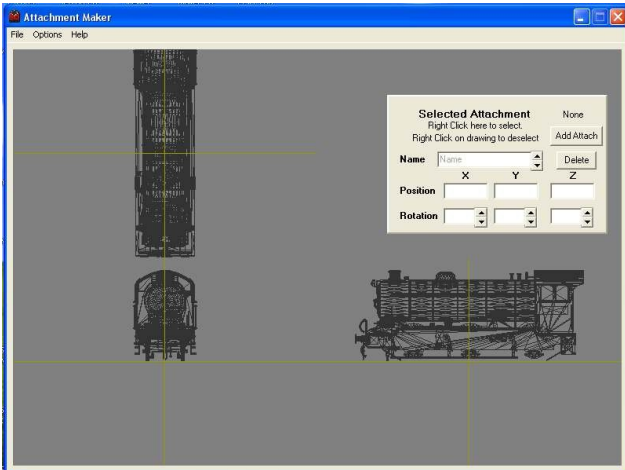
Auran's TrainzMeshImporter.exe is included in the setup program. It may require a further download from MicroSoft (See below)

Note that the beta and first release versions of this program have some errors in the attachment rotation mathematics that have now been resolved.

## Opening a File

The purpose of this program is to add attachments to an existing asset. Say for example you want to add safety valve and whistle attachments to a small steam loco for visual steam outlets.

Firstly use Content manager to open the loco asset for editing and find the main body mesh. Then launch Attachment Maker and open the body mesh using the File Open menu.



Note the loco body is in three views. Top left is plan (top) view, lower left is front view, and lower right is the side view.

Use the mouse wheel to zoom in or out. Note that all views zoom at the same rate (on purpose) Zooming is also possible by using the cursor Up/Down keys with the shift key. The mouse cursor must be on the drawing for the key zoom or pan.

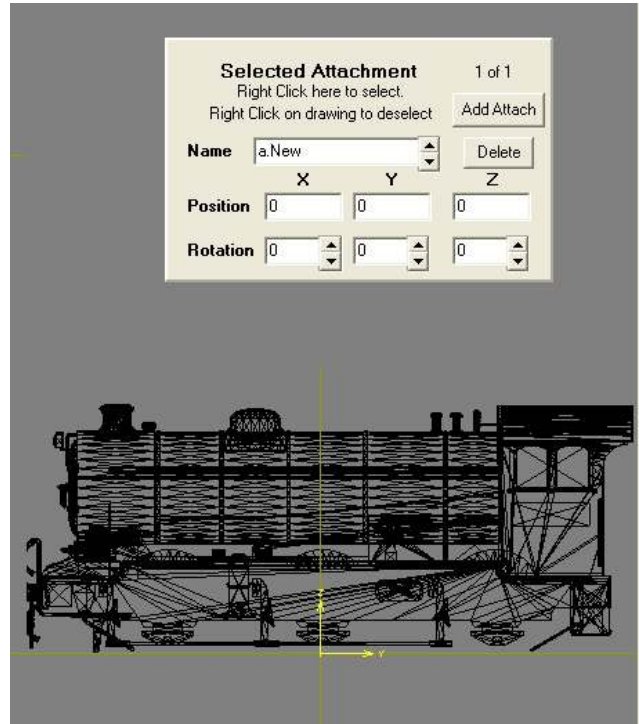
Press on the mouse wheel and drag the mouse to move a view to look closely at some portion. Note that the views move together to maintain a view of a particular point in the drawing.(again on purpose.. quick and simple is the objective here) Panning can also be done by selecting a view (with the mouse or touch pad) and pressing the cursor keys with the Ctrl key.

Window size can be changed by dragging the edges of the window.

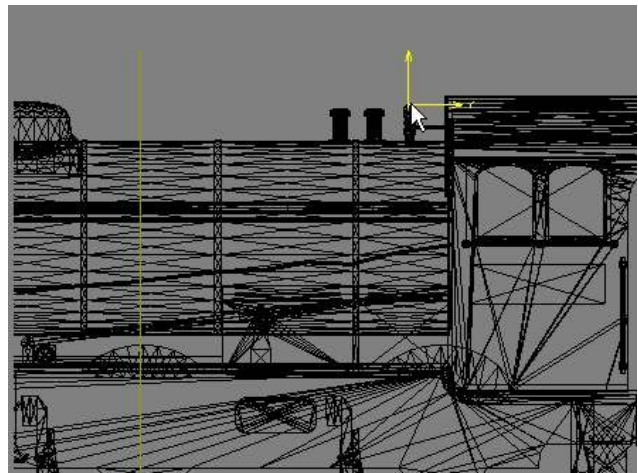
## Adding an Attachment Point

To add an attachment point ensure you have an axis origin visible in at least one view. The origin is where the dark yellow axis lines cross.

Press the "Add Attach" button in the panel on the upper right side of the window. A yellow attachment tripod will appear at the origin, (in all views).

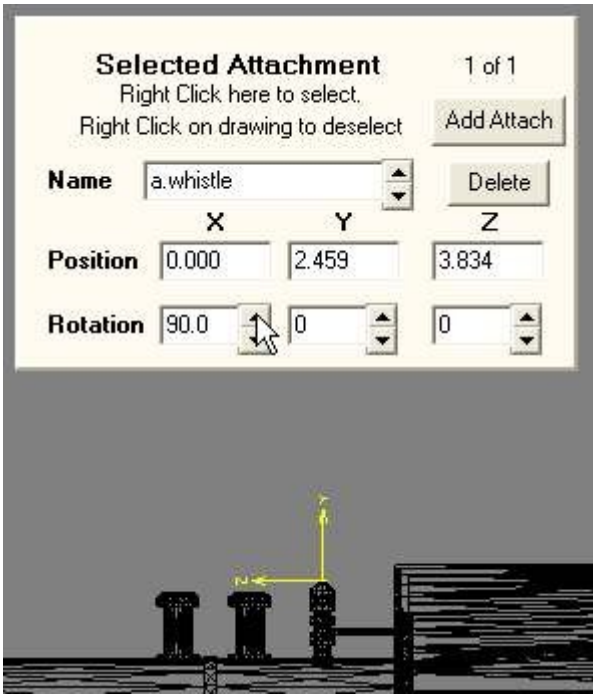


Left Click in any view and the attachment tripod will follow the cursor when you drag it. Positioning as you can see takes moments.



In the case of our steam loco example, move the attachment to the top of the whistle, and rotate as necessary to have the Y axis of the tripod pointing in the direction of steam flow. In this case rotating about the X axis will make the Y axis of the attachment tripod point upwards.

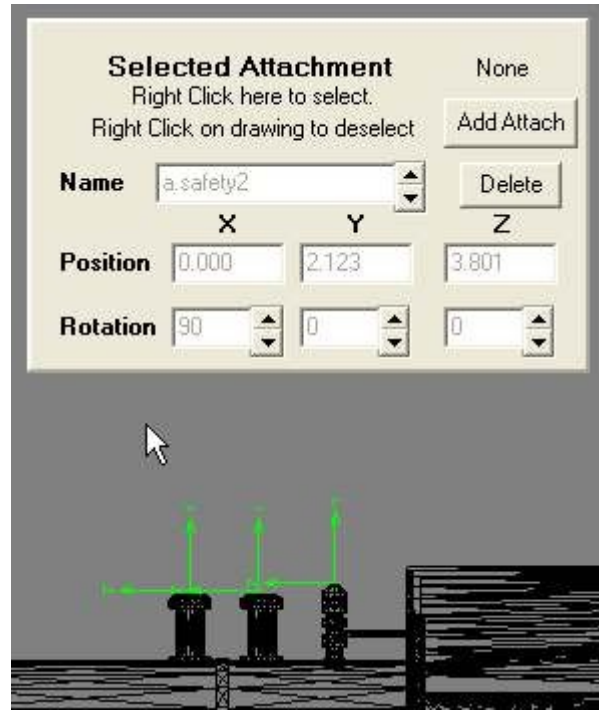
To rotate the attachment you can use the up/down buttons next to the rotation axis box, or enter a number in the box.



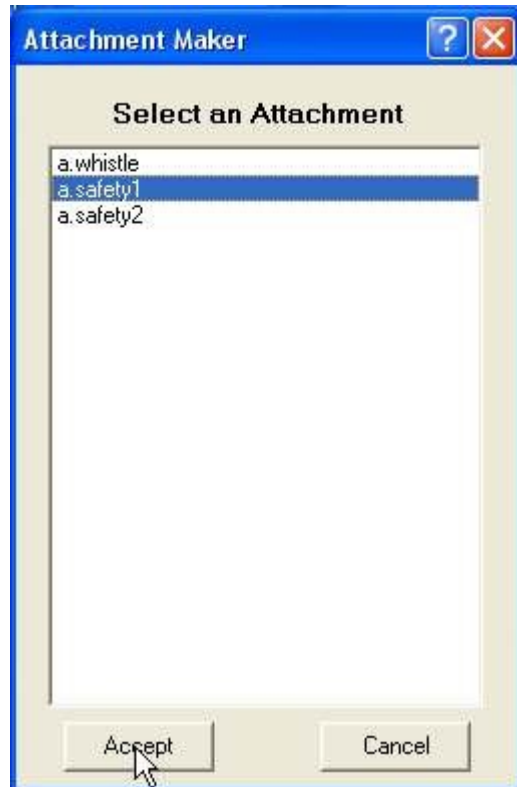
In the "Selected Attachment" panel with the "Add Attach" button, there are edit boxes to change the attachment name, its position, and its rotation.

When you press the "Add Attach" button the new attachment is always called "a.New". In our example, change the name to "a.whistle" in the name box on the Selected Attachment panel.

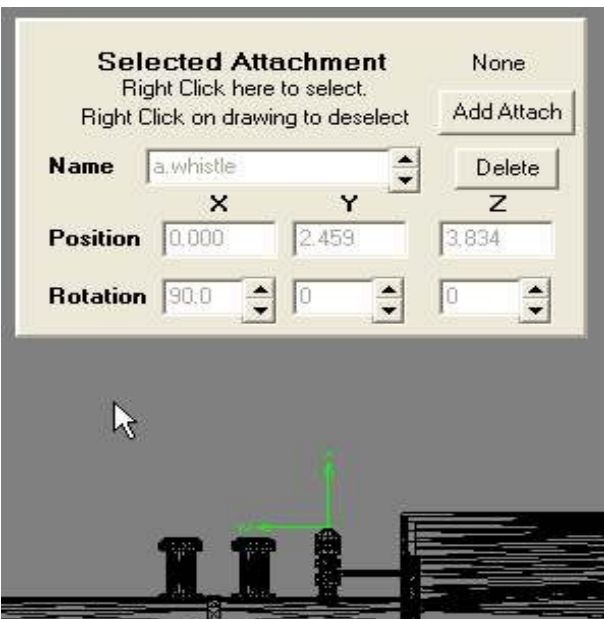
When you are happy that you have the attachment correctly located and named, Right Click on the drawing and the attachment will be locked, and deselected. It changes colour from yellow to green when deselected as in GMax.



To edit an attachment, you can select by Right Clicking on the Selected Attachment panel. A list of attachments will be presented and you can choose one by name.



Click on an attachment and press the "Accept" button to select. "Cancel" turns off the selection window. Remember that the selected attachment is yellow on the drawing.



Repeat the process above to add more attachments. (The safety valve attachments in our example)

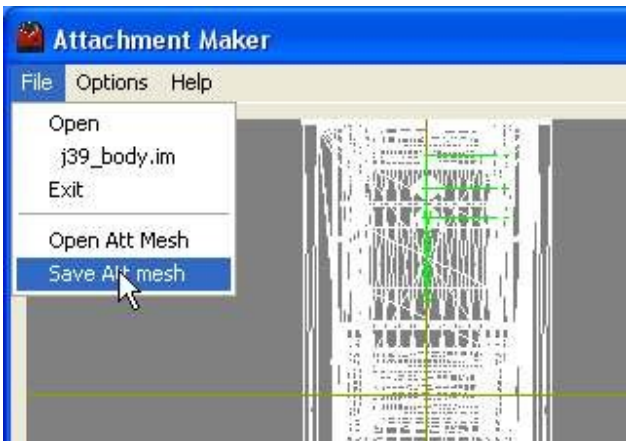
You can also change selection with the up/down buttons next to the name box. (Please note at this stage in program development I don't have attachment selection by mouse click working)

A selected attachment can be deleted by pressing the "Delete" button.

## Making the Attachment Mesh

When you have placed your new attachments the results are saved in the form of a mesh named "attach\_mesh.im". The name can be changed, if you so desire, in the Save file dialogue.

To save the mesh click on the "Save Att Mesh" item in the "File" menu.

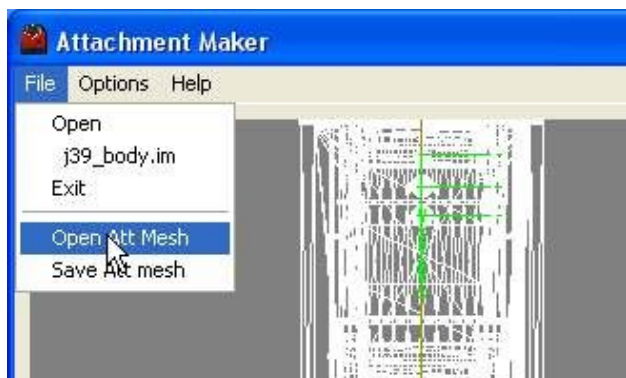


Your new attachment data is converted to a mesh by TrainzMeshImporter. The mesh has a single plane surface 20mm square invisible from above, but visible from below.(just to test its validity) The mesh requires no textures.

Please be aware that the program overwrites any existing "attach\_mesh.im" file when saving the data.

## Editing an Attachment Mesh

If you are unhappy with your attachment mesh or wish to add more attachments, you can edit the mesh by first loading the parent mesh using the "File" "Open" menu as above. Then click on the "Open Att Mesh" item in the "File" menu.



Select the "attach\_mesh.im" and the attachments will be reloaded and displayed on the drawing.

Additions, deletions, and edits are easily done once the appropriate attachments are selected.

## Putting the Attachment Mesh into Trainz

To make the attachments work in Trainz an attachments mesh reference must be added to the mesh table in the config.txt file for the asset. The following example adds attachments to a single mesh object.(mesh table only shown here)

```
mesh-table {
    default {
        mesh          "steam_loco.im"
        auto-create   1
    }
    attachments {
        mesh          "attach_mesh.im"
        auto-create   1
    }
}
```

Because the two meshes share the same origin, (the second having been built around the first) no other data is needed.

The above assumes that "steam\_loco.im" and the "attach\_mesh.im" file are in the same folder as the config.txt file. (the asset root folder). The program help shows an example where the meshes are in a sub-folder of the asset. See the Content Creators' Guide for your Trainz version for advice on asset folder layout.

The attachments should now behave as if they are part of the default mesh.

If you have added passenger, load, or smoke attachments and so on further additions will be needed to the config.txt file. Again, refer to your Content Creator's Guide.

## TrainzMeshImporter

As part of the attachment mesh generation process, Attachment Maker creates a file in XML format which is then converted to an IM by Auran's TrainzMeshImporter program. Auran's policy of having their own software make all game content is thus maintained.

The Attachment Maker program will not operate if the TrainzMeshImporter.exe is not in the Attachment Maker application folder. A notice to this effect is displayed for a few seconds before the program closes.

TrainzMeshImporter is included in the Attachment Maker installation package and is latest version as of 17 April 2010.

TrainzMeshImporter requires some Microsoft C++ 2005 SP1 runtime files, and if these are not present the TMI will not run, or may freeze. The Attachment Maker will fail to produce an output mesh in this instance.

The files can be downloaded as a package from <http://www.microsoft.com/downloads/details.aspx?familyid=200B2FD9-AE1A-4A14-984D-389C36F85647&displaylang=en>

To test that TrainzMeshImporter is working open a DOS window in the Attachment Maker application folder.

To open a DOS window, create a file named "DOSWin.bat" in the Attachment Maker application folder. The file should contain the following two lines:-

```
@echo off  
cmd.exe /k
```

When you run this batch macro a DOS window will be opened. Type "trainzmeshimporter.exe" in the window. The TMI will display its help page if all is working correctly.

### FootNotes:

1. In the program help there is a reference to an error message "Gimball Lock. Cannot resolve angles." This message will only occur if reloading an

attach\_mesh.im and there is an attachment rotation where the Y axis rotation is + or - 90deg. The mathematics to convert a rotation matrix to axis angles has a divide by zero occurrence under these conditions. The program will zero the X axis angle and make the Y axis 90deg, hopefully leaving any Z axis rotation as it stands.

The problem is called "Gimball Lock" because the same mathematics is used in gyro guidance systems and gyros are mounted on gimbals. (the rings with bearings that allow x,y,z rotation of one object relative to another.)

It's best to avoid Y=90deg or Y=-90deg. However it will still work, the conversion from angles to matrix works fine. It's the reloading of such data back into this program that will give the message. Fortunately rotation around the Y axis is rare in Trainz because the Y axis is used as a direction pointer, so rotations about the X and Z axes are used to have the Y axis pointing in the desired direction. See the CCGTC for advice on orienting smoke attachments as an example of this.

2. The Attachment Maker program, can handle 256 attachments in one mesh. This is the same limit as the Trainz game itself imposes.