ADE - GROUND POLYS - USER MANUAL

VERSION 1.0

ADE Ground Polys ("ADE_GP") allows you to create ground cover and markings directly from the ADE display for use with FS9 and FSX.

Background

By way of background, FlightSim (both FS9 and FSX) displays objects by determining for each pixel on your screen the distance from your "eye" to the point on each object in view that pixel represents. Hence, the closest object is displayed fully while only those portions of objects further away that are not covered by closer objects are seen.

But, if, for example, you have created a building and a sign mounted on it as separate objects (so as to get higher resolution for the sign), both objects will be the same distance from "your eye" and this results in Z-fighting (i.e. "flickering"). To resolve such a situation, you move the sign a short distance (a few inches/cm.) away from the side of the building.

A similar situation exists when you attempt to cover the ground with, for example, a plane (not an airplane, a flat polygon) to be textured as, say, asphalt for the base for a parking lot. If the parking lot is away from where the user aircraft might venture, you can place that plane slightly above the ground to eliminate flicker. The further away the plane can been seen, the higher it must be elevated because, when viewed at shallow angles, the benefits of its elevation are reduced (think trigonometry). But, if that plane is right beside an apron, its elevation, unless very small, will be apparent when viewed from the user aircraft on that apron.

As well, you cannot "draw" (place planes) directly on top of runways, taxiways or aprons; you must elevate them. Elevating only a mm/fraction of an inch works fine up close, but you'll get flicker when viewed from a distance. If you elevate enough to eliminate flicker, that elevation will be readily apparent up close.

FS8/FS2002 provided a mechanism to place planes directly on the ground ("ground-polys" for short) without causing flickering, As well, planes could be placed directly on top of runways, taxiways and aprons. Fortunately, both FS9 and FSX utilize FS8-style ground polys.

Previously, creation of ground-polys was a time-consuming, complex process - involving the use of Gmax or other 3-D editor, FS8 MakeMdl (which was not generally available) or a substitute, hand-tweaking of the resulting assembly code, submission of that tweaked code to FS9's BGLC_9 compiler and, finally, copying of files to the destination scenery folder. Even a minor change required repeating the entire process. Until now, that is!

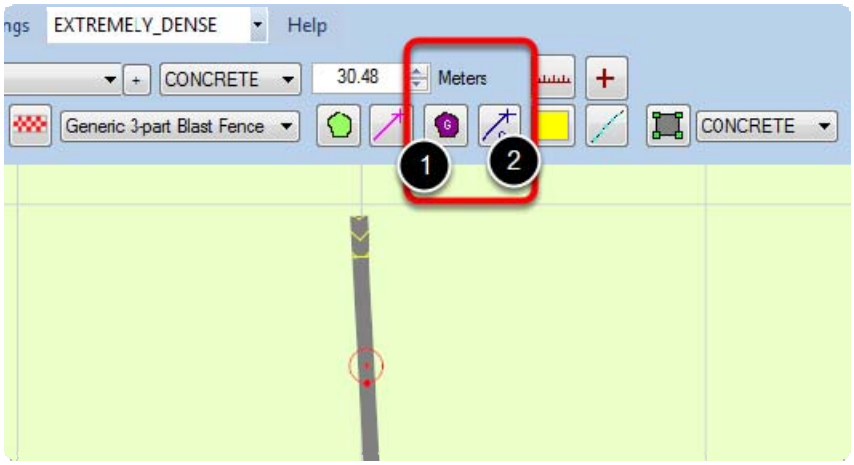
Neither FS9 nor FSX has any inherent ground poly processing capability. Their processing of FS8-style ground polys, while generally adequate, is subject to:

- **flickering of shadows cast on the ground by scenery objects and aircraft,**
- **suppression of autogen, and**
- **for those of you who use the DX-10 Preview mode with FSX, an aversion to displaying ground poly (and other) night textures.**

All have been addressed to the extent possible in ADE_GP. A workaround for the DX-10 issue has been implemented. Avoidance of autogen suppression may, however, require some experimentation on your part. For a fuller discussion of autogen suppression, please refer to Appendix "A" - Autogen Suppression by Ground Polys.

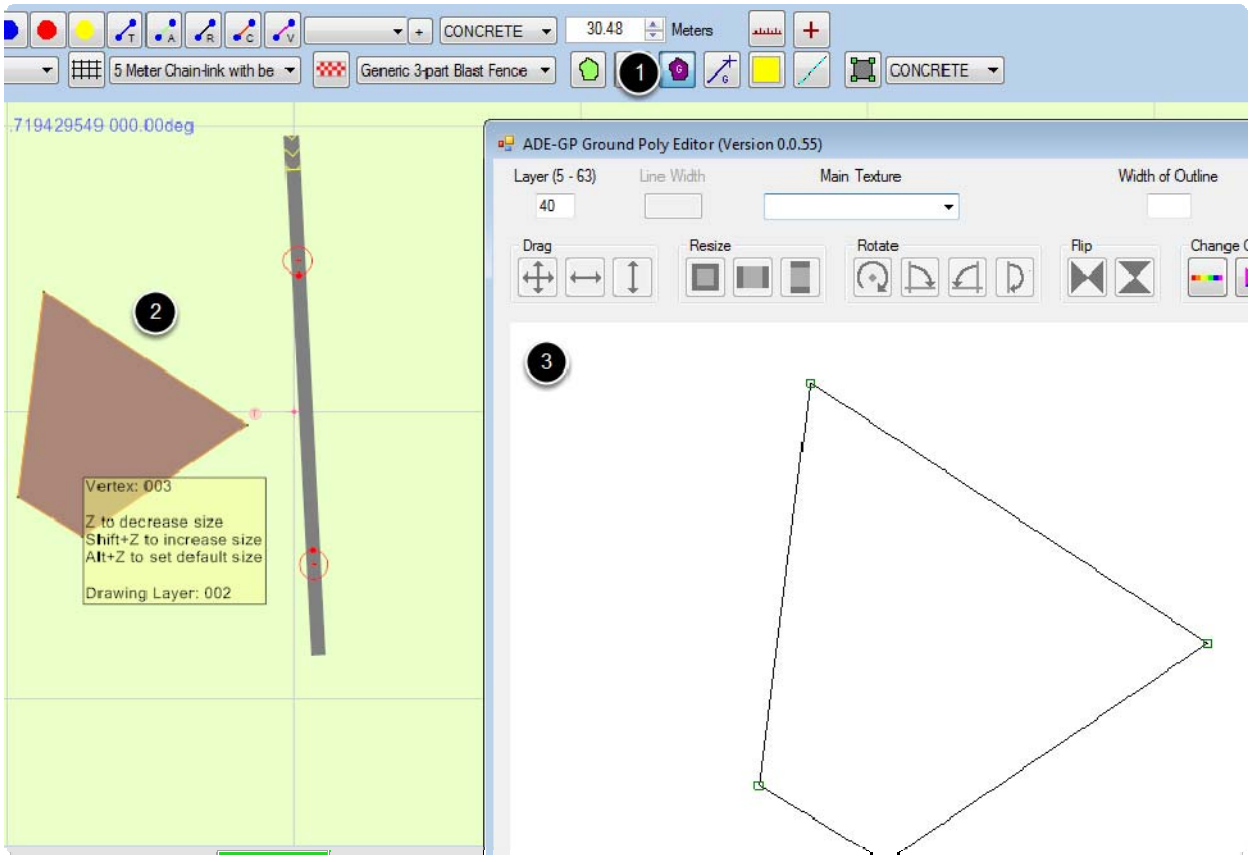
ADE Controls

ADE supports creation and editing of custom ground lines and polys. There are two new buttons in ADE's button bar: 1. custom ground polys and 2. lines



To add a custom ground poly:

1. Select the Custom Ground Poly Mode by clicking button 1.
2. Draw the polygon in the usual way remembering to double-click the last point to complete the poly. The GP Editor will open to allow entry of the required properties. Please refer to later sections in this manual for instructions for using the GP Editor.



3. Specify the texture to be used, complete any necessary additional editing, and close the GP Editor.

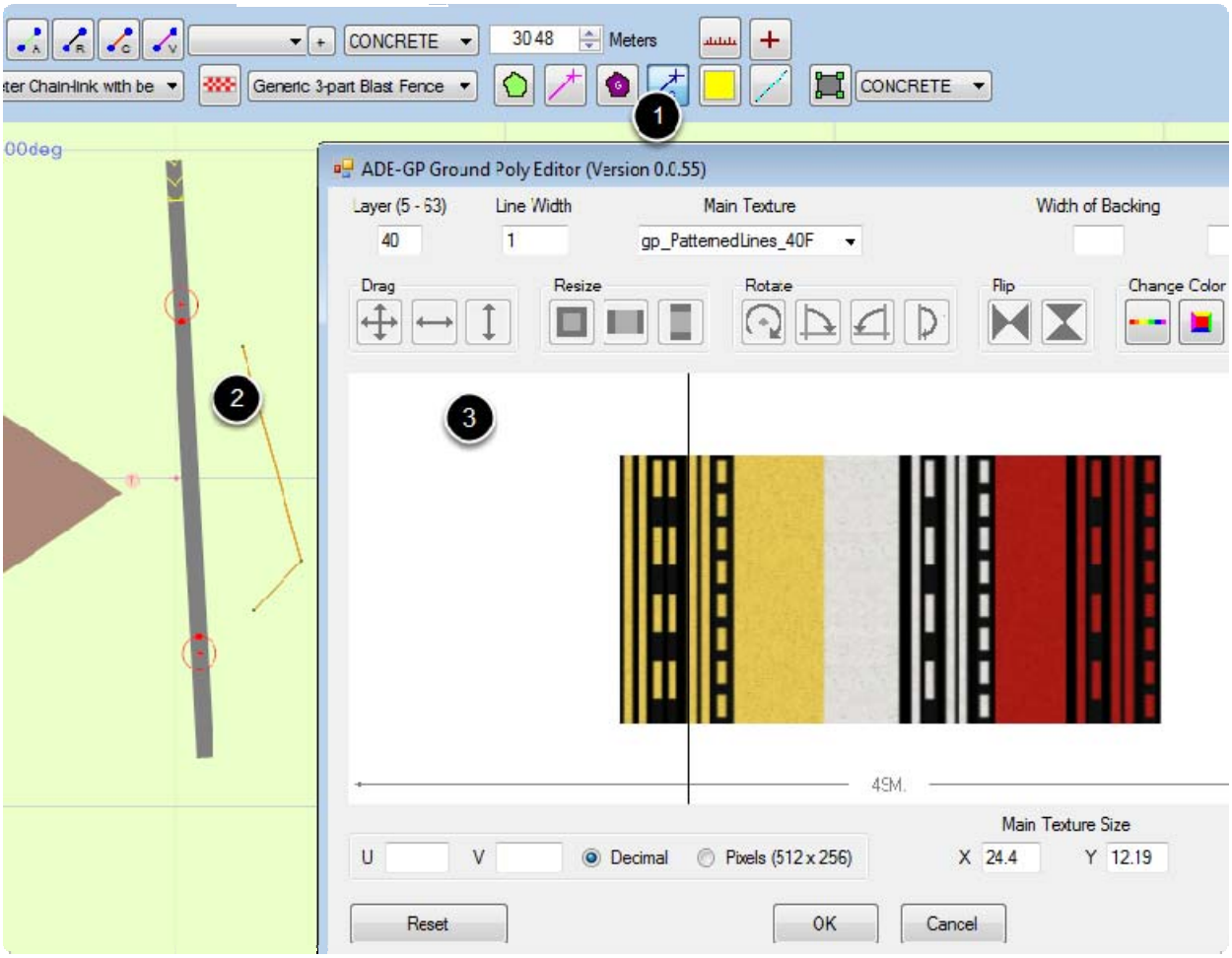
The finished poly will be displayed by ADE. The tooltip will show its details.

For a custom ground line, the process is similar:

1. Click the Custom Ground Line button (Button 2 above).
2. Draw the line as shown below, remembering to double-click the last point to complete the line.

   As before, the GP editor opens.
3. Specify the width of the line and the texture to be used, complete any necessary additional editing, and close the GP Editor.

The line will be displayed by ADE with a representative width. The tooltip will show its details.



In either case, you may:

1. Use Cancel in the Editor to cancel the addition of a poly or line.
2. You can also use the Undo button to remove any poly or line that you add and do not want.

Edit Custom Ground Line or Object

Custom ground polys and lines can be moved, edited or deleted in the same way as any other ADE object. However, it is important to understand that the GP Editor will not automatically open when you add, delete or move vertices. In those cases, you should manually open the GP Editor (right-click on the object) to handle changes to the texture mapping that may be required.

Using ADE Helper Shapes

ADE has a number of helper shapes that can be used to help create custom ground lines and polys. Their use is discussed later in this manual.

The Ground-Poly Editor

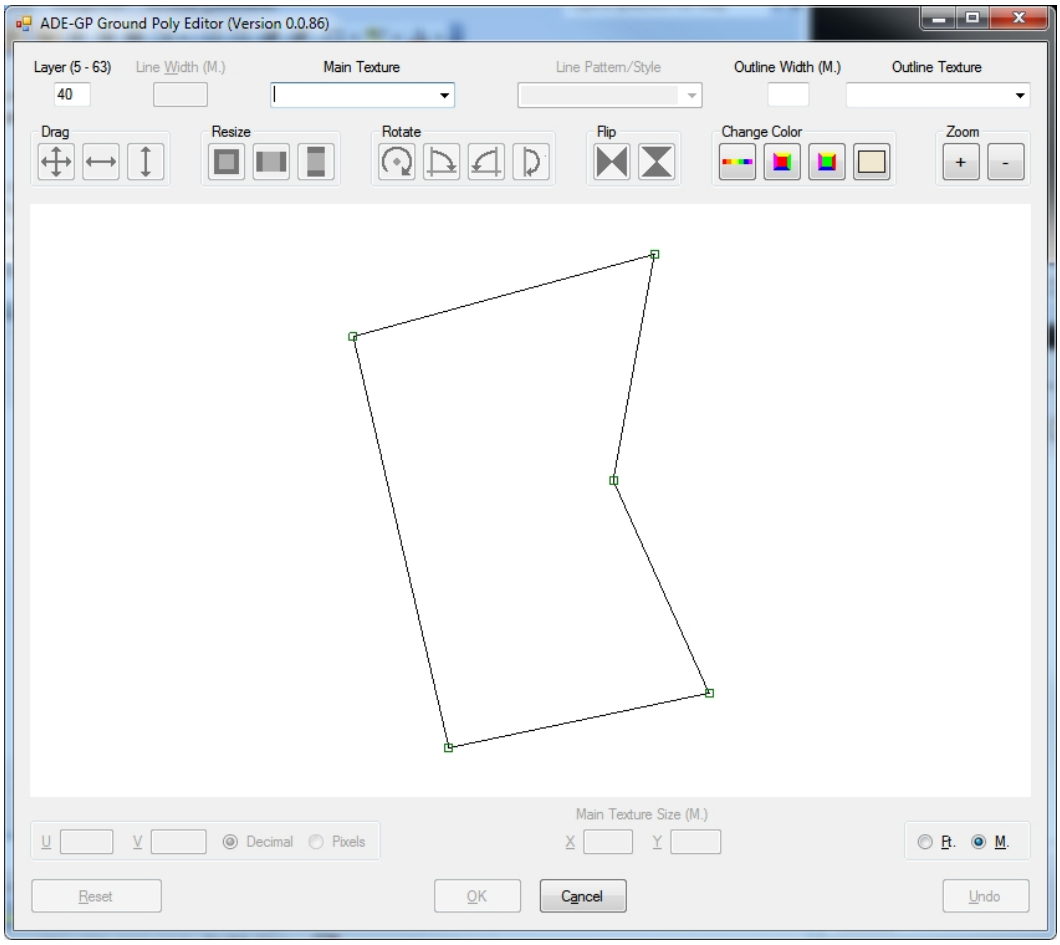
It is essential to recognize that the physical location of a GP object is specified with ADE. The purpose of the GP editor is to manage the application of the texture to the object. When you move a vertex on the GP editor, its physical location is not changed; only its position on the texture sheet is updated.

The Ground-Poly Editor is shown below as it would appear immediately following specification of the boundaries of a poly. Across the top are two text-boxes, a button and three combo-boxes in which you enter the parameters of the ground poly:

Layer: The layering scheme is arbitrary. ADE initializes this window at 40, but you may use any layer number between 5 and 62. (63 is reserved for the avoidance of autogen suppression.) When rendered in Flightsim, higher-numbered layers are drawn over lower-numbered layers. If you make use of the line-base or poly-outline features (see below), you should use layer numbers separated by three or more to avoid backing and outlines inadvertently overwriting or being overwritten by other ground-polys. Otherwise, layer numbers can be sequential.

Make Default: A button (not shown) to make the current layer number the default for new ground poly objects. This button will be disabled (greyed-out) if the number in the Layer textbox is already the default.

Group: An arbitrary group number (textbox not shown). This field will normally display “Auto” and should only be changed if necessary. (See “Compiling the Ground Polys”)



The Ground-Poly Editor

Line Width: As the name suggests, here you specify the width of lines. The width is specified in feet or meters, depending on the setting of the dimension radio-buttons in the lower right-hand corner of the dialog.

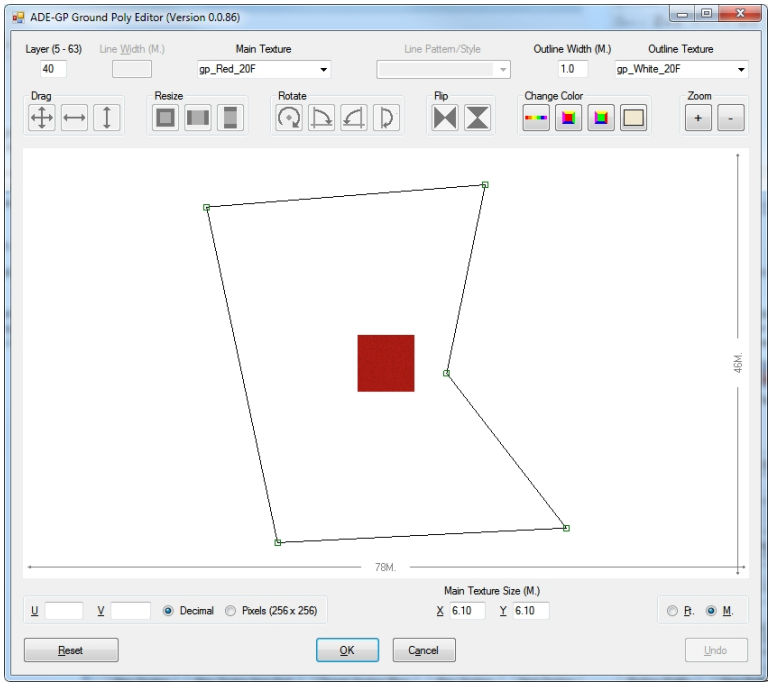
Main Texture: A combo-box holding the names of all the available textures from which you select the texture to fill the line or poly. A tooltip showing the texture is displayed whenever the mouse hovers over a name. After selection, an image of the texture will appear centered in the display window.

Textures that should satisfy most generic requirements are supplied. You may add your own custom textures. See Texture Management below.

As well, instead of selecting a texture, you may specify a RBG color for the object as "< *red, green, blue, alpha* >" where each component is an integer 0-255. The angle-brackets are an integral part of such specification. If you enter simply "<>", a color dialog will appear from which you may select the

color. The "alpha" value will default to 255. If you want some other value, you'll have to enter it manually. Once a valid entry has been made, the background color of the combo-box will be changed to that color.

Width of Outline: For lines, this title will be Width of Backing. You may specify polys be outlined, in which case a line of the specified width and texture (next control below) will be drawn around the poly one layer higher than the poly, its outer edge coincident with the outer edge of the poly. Often, for better visibility, lines at airports painted on lighter surfaces will have a dark backing wider than the line itself. When specifying a line, if a value is entered into this textbox, a backing line of that width will be drawn one layer lower than the line itself. Outline/backing line widths are specified in feet or meters, depending on the setting of the dimension radio-buttons.



Poly with texture applied

Outline Texture: For lines, this title will be Backing Texture. A combo-box holding the names of all the available non-patterned textures (see Texture Management below) from which you select the texture to be used for the outline or line backing. As for the main texture list, a tooltip showing the texture is displayed whenever the mouse hovers over an item in the list. As for the main texture, you may specify a RGBA color instead

The next line of controls is a series of toolbar buttons for:

- manipulating the texture U and V parameters (i.e., the horizontal and vertical location of the vertices relative to the texture origin) by dragging, resizing, rotating and flipping;
- selecting the color of lines, selected vertices, unselected vertices and display background; a left-click brings a color-dialog into view; a right-click restores the default color); and
- zooming the display; you may also zoom using the mouse wheel.

Operation of the GP Editor is similar to the Gmax UVW Editor. An image of the selected texture sheet is displayed together with the vertices of the object - initially in positions determined by their lat/lons. Textures may be specified as covering a certain distance. When a texture is first selected, if coverage is specified (see Texture Management), the image of the texture is scaled according to the dimensions of the poly or line object. Except as described for single-segment lines below, if no coverage is specified, the texture is drawn so as to just enclose the line or poly and coverage is deemed to be whatever is necessary to do so. On the Flightsim display, if the coverage of a texture is inadequate to cover the whole object, the texture will be tiled as required.

When an object is first created, its vertices are displayed in their *natural* position relative to the selected texture. For most polys, this is what you will want, and no further adjustment is necessary. If you do move vertices, it is important to remember that, in doing so, you are not changing their lat/lons (this can only be done on the ADE display), you are simply changing their position relative to the texture. Stated another way, you are stretching or compressing the texture as it will later be applied to the object. Adjustment of vertices with the GP Editor should only be necessary when applying a pattern, in which case the vertices must enclose the desired pattern.

In the lower left-hand corner of the dialog are additional UV controls. When a vertex is selected, its U and V values are displayed here. Those values may be changed either by manipulating the vertices with the toolbar controls or by entering the desired new value(s) here. If more than one vertex is selected, these controls only display common values. If an entry is made into either text box, all selected vertices take on that U or V value. U or V values may be displayed in decimal form, i.e., fraction of texture width /height or in pixels - in either case relative to the texture origin - the bottom left-hand corner. It is unlikely you'll have much use for these controls other than when creating patterned polys, such as cross-hatched areas, parking lead-in lines, parking lot lines, etc.

There are two text boxes under Main Texture Size. The coverage for each axis is displayed in these boxes. You can adjust them by specifying in these text boxes coverage for either axis.

Across the bottom of the dialog is a series of buttons:

- Reset: the vertex positions revert to the position based on their latitude and longitude. Any prior X/Y and U/V edits are discarded;
- OK: the current situation is saved and the dialog closes; This button is not enabled until the layer, texture and, in the case of lines, line width have been entered;
- Cancel: changes, if any, are discarded and the dialog closes;
- Undo: the most recent change is undone. You may also use <Ctrl>Z to undo.

Textures

ADE Ground Polys includes a number of textures used by the author for his airports. Frequently encountered line patterns are included as are a number of other patterns: e.g., walkway, crosswalk, cross-hatches, aircraft parking designators and automobile parking lot lines, and some useful text signs: RESTRICTED AREA, NO PARKING, etc. You may supplement these with your own textures. (see Texture Management near the end of this manual.)

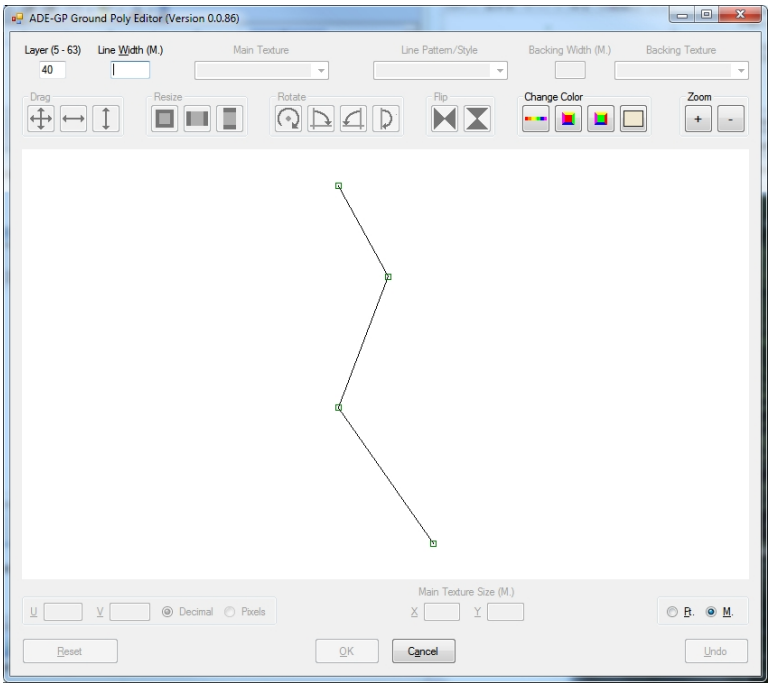
The GP Editor allows use of both dimensioned and un-dimensioned textures. (A dimensioned texture is one for which the coverage in one or both axes is specified. The enclosed texture *gp_PatternedLines_40F.bmp* is an example of a dimensioned texture. It is defined to cover a distance of 40 ft (~12 m.) vertically. Conversely, an un-dimensioned texture is one for which coverage is not specified for either axis. An example of the latter is *gp_Patterns.bmp*. This texture sheet includes a number of common patterns that may be used with both lines and poly and that may be resized to cover any area desired.

The texture definition files *Textures_Def.txt* and *Lines_Def.txt* define how each texture is used. The former defines the coverage of the textures while the latter defines the position on the texture sheet of various patterns. They are described more fully in the Texture Management section.

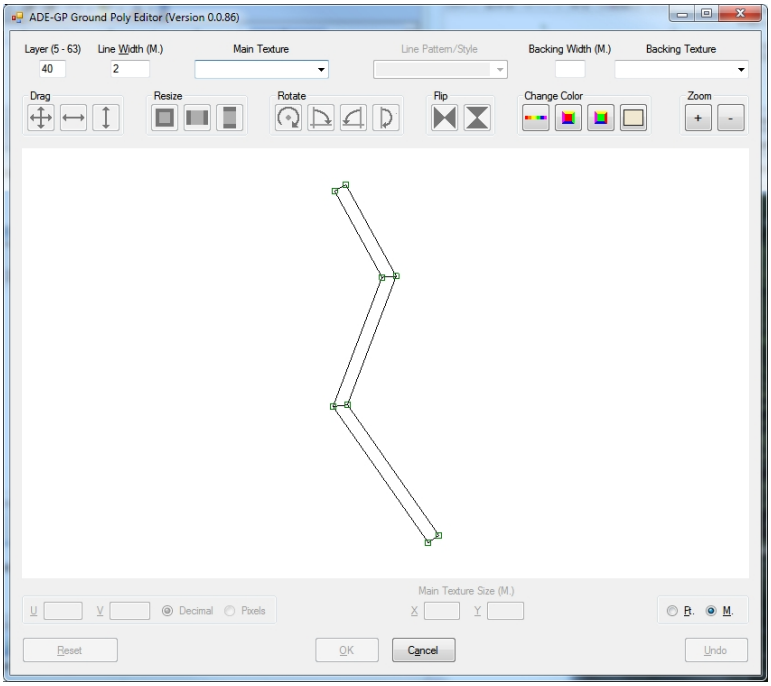
Creating Polys

All operation for polys are covered in the previous section.

Creating Lines



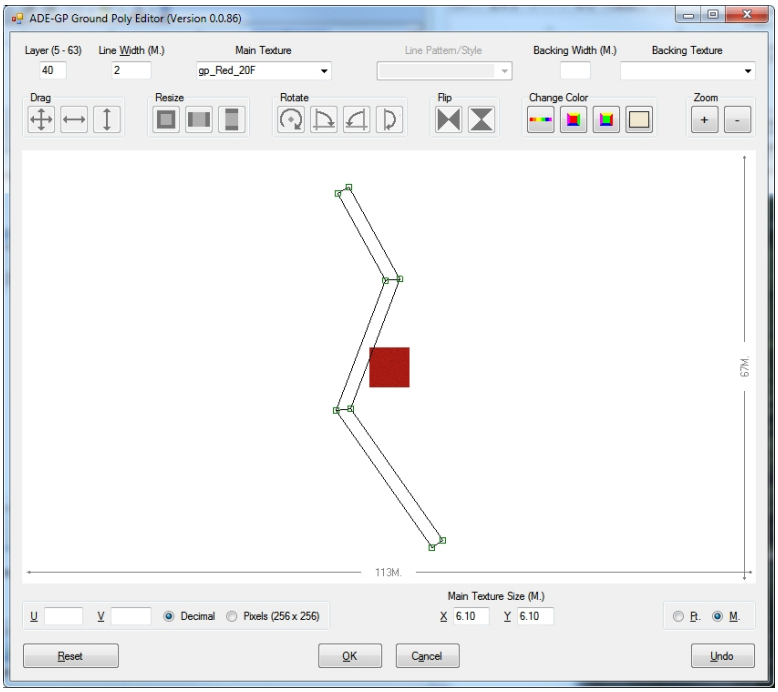
New Line



Line after Width Entered

When the editor opens for a new line, the display will be similar to the illustration above. Other than layer number, which may be entered at any time, all controls remain disabled (greyed-out) until you enter a line width (ft. or m). Once entered, the display becomes:

Next, select the texture:



Line with Texture

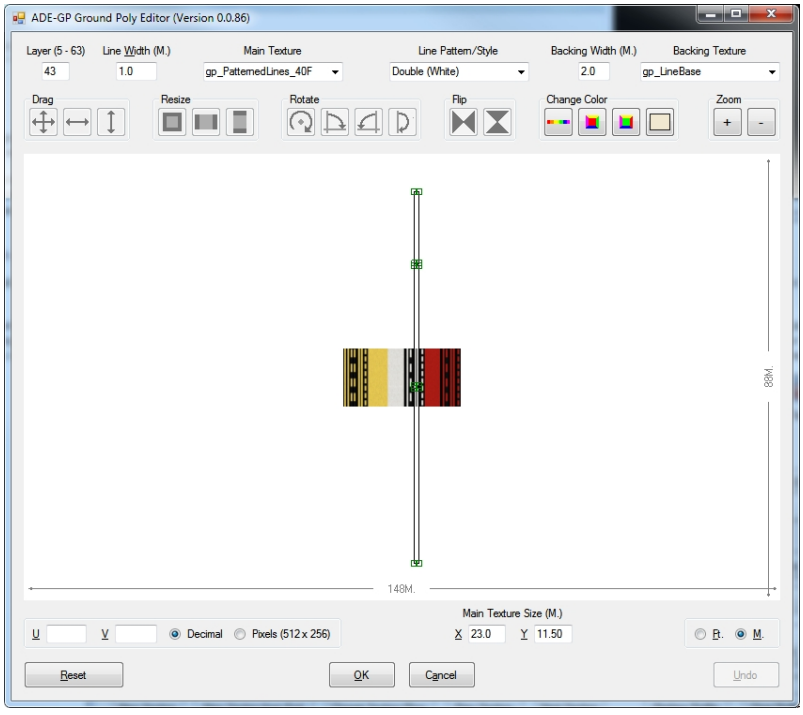
If the selection is a uniform texture, you are now done. Just click OK. However, if you select a texture that supports patterned lines, the Line Pattern/Style combo-box will be dropped down and will display all the line pattern/styles available on that texture. Select the one you want.

Please note, as you scroll down the list of textures in the textures combobox, the texture is displayed beside the combobox. However, as mentioned elsewhere, textures in the Textures_Dpy folder **MUST BE** in 24-bit (or other Windows-compatible) format in order to be displayed. If a incompatible format is encountered, the texture is not displayed and a "beep" is issued

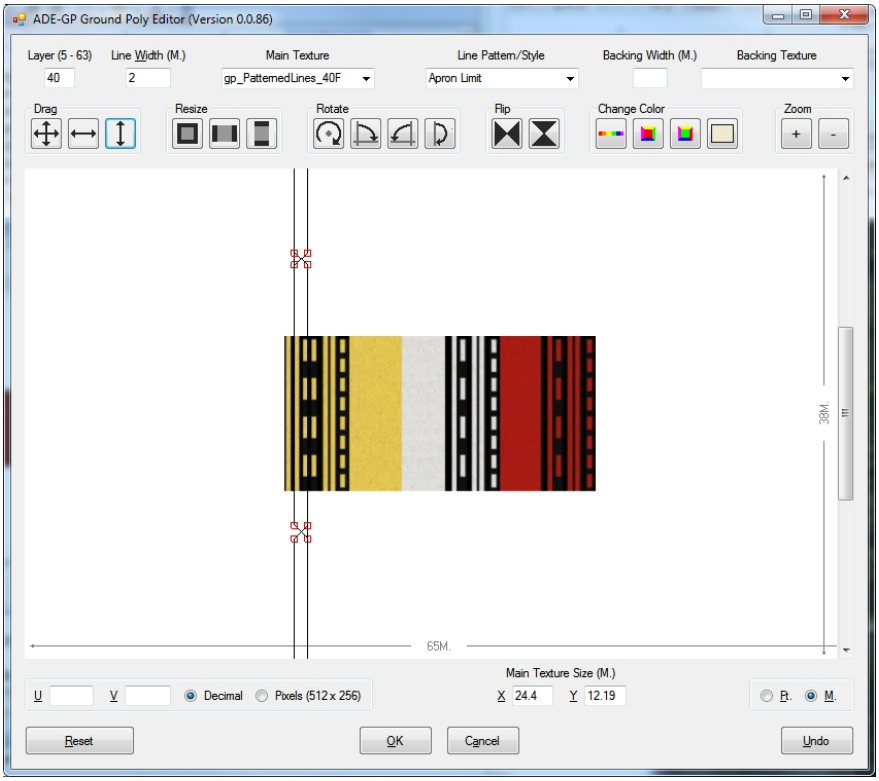
Immediately, the line is straightened and redrawn as shown. In this example, I selected a double white line pattern. As you can see below, the vertices have been adjusted so that the texture will be applied properly at the corners of the line.

Un-Dimensioned Line Textures

Often, you will want to display something in a perfectly rectangular area for example, a crosswalk or area of vehicle parking lines. You could create a poly for this. However, a single segment line can be used as well, and has the advantage that its sides will always remain parallel, even if a vertex is moved. Just create a line along the centerline of the area to be covered and select the texture and line-pattern to be used. ADE_GP will do the rest But remember, this only applies to single segment lines,



Line Straightened



Line Pattern Selected

Editing Lines and Polys with the GP Editor

You may also move, resize, rotate and flip GP objects (relative to the texture) using the various buttons located just above the GP Editor display panel. Vertices must be selected in order to be manipulated. A vertex is selected by clicking in close proximity to it or by enclosing it in a "select-box" (depress the left mouse button and move the mouse). The <Ctrl> key serves its usual purpose. All vertices are selected when you double-click on any one of them. Once the vertices are selected, left-click on the function button and move them as desired. Whenever vertices are being dragged, resized or rotated, the amount of the move is shown continuously in the upper left-hand corner of the editor display. Alternately, right-click on any of the resize buttons or the freehand rotate button and a small dialog box will pop-up into which you may enter the amount of resizing as a proportion of the current size (e.g., 2.0, 0.5) or the amount of rotation in degrees. Then, click Continue.

Once you have made whatever changes are necessary, click OK to save them. If you click Cancel, any changes you have made in the GP Editor will be discarded - but any prior changes in ADE will be retained - except in the case of an object being created when the object will be deleted from ADE.

If you rotate or move a poly, the previous texture application is retained. If you add or delete vertices (on the ADE display), ADE_GP will attempt to adjust texture application to reflect the new situation. If you simply move one or more individual vertices, you will be asked if you want the texture application to be adjusted - but there must be at least two vertices that have not moved. If that object is a line that you have flipped, rotated or resized (an unlikely situation), you'll have to

redo those adjustment(s). In any case, to be sure the result is what you want, you may wish to examine the object in the GP Editor immediately after the operation. Certain operations require that an object be edited before it can be compiled. If you don't edit at the time of the operation, the compile will be interrupted to allow you to do it later.

PLEASE REMEMBER

When a line or poly is first created, the texture is assigned so that it will appear naturally across the object. If the object is larger than the texture sheet, the texture will be uniformly tiled over the object (when displayed by Flightsim)). If the texture sheet is larger than the object, only that portion of the texture lying within the object outline will be applied.

When editing objects, please appreciate that when you move individual vertices, what you are actually doing is stretching or compressing the texture. The physical location (lat, lon) of the vertex is unchanged. Usually, you should only need to move individual vertices in the editor if you are attempting to texture the object with only a portion of the texture sheet, e.g., a sign, parking lines, etc.

Rotating or dragging all vertices simultaneously may be required to properly align the object to the texture, but does not result in stretching or compression of the texture. Resizing will, of course, stretch or compress the texture but does so in a manner so as not to distort the application of the texture.

If you want to change the physical location of a vertex (i.e, its lat,lon), you must do so in ADE.

Copying Lines and Polys

ADE allows you to copy ground poly objects and paste them into other locations. Copies will have the same texture placement as the original. However, until you call the GP Editor after pasting an object elsewhere, it will still contain some data referenced to its old location.

This is not a problem so long as you don't make any adjustments to the object. When you eventually compile your project, these obsolete references will be updated. However, if you make any other adjustments before calling the GP editor, the rendering of you object by Flightsim may not be as you intend. Therefore, it's a good idea to always call the GP editor after a copy/paste operation.

Should you end-up with unintended results, you can click the Reset button and rework the texture placement.

Error Messages

When you create or edit an object, the GP editor checks for certain conditions that may prevent the object from being compiled or from being displayed properly in FlightSim. If such conditions are found, one of the two following messages is issued:

- `Two or more vertices in this object are superimposed; or`
- `Two or more sides of this poly intersect.`

Both are suffixed with: `It may not be drawn in FlightSim as you expect.`

If such conditions escape earlier detection (or you don't fix them), the following message may be issued, either by the GP Editor or by the compiler:

- `The ground poly object bounded by:`
  `Latitude - min:` *`value`* `max:` *`value`*
  `Longitude - min:` *`value`* `max:` *`value`*

```
    Vertices not triangulated: a, b, c, d
cannot be properly triangulated and may have to be simplified.
```

In the first two cases, the error message explains the problem and the required action should be apparent. In the latter case, some investigation on your part may be necessary. Except for unfixed errors detected by the editor, this message likely will only occur for large, irregularly-shaped ground polys - particularly if you have any superimposed vertices. If you receive such a message and the cause is not immediately apparent, a good first step is to identify the line or poly of concern and open the GP editor, which may give you further detail.

As well, you are free to move/add/delete vertices of GP objects without going to the GP Editor. However, if you don't open the editor at the time you make such changes (move of the entire object excepted) and you attempt to compile the file), the following message may be issued:

- ```
  The ground poly object bounded by:
      Latitude - min: value   max: value
      Longitude - min: value  max: value
  must be edited before it can be compiled in its current form/location.
  Do you want to edit it now?
  ```

If you decline, that object will not be compiled. You also have the option of cancelling the compile operation.

Triangulation is a processing-intensive activity involving complex math. Such problems are usually due to loss of precision as the triangulation proceeds. To accommodate this possible loss of precision, the compiler ignores positional differences of less that 1mm. This could result in a triangle with 0-area, in which case, it's absence will not be noticeable (but you'll still get the error message). Sometimes, just "wiggling" a vertex in a complex area will solve the problem. Or you may have to split larger objects into two or more adjacent smaller objects. Unfortunately, there's no "one size fits all" solution and so experimentation on your part may be unavoidable.

Compiling the Ground Polys

The ground polys are compiled whenever you compile your airport layout. The compiled ground polys are saved to the same folder as the compiled airport file in a file named as the airport .bgl file suffixed with "_GP". As well, all required textures are copied to:

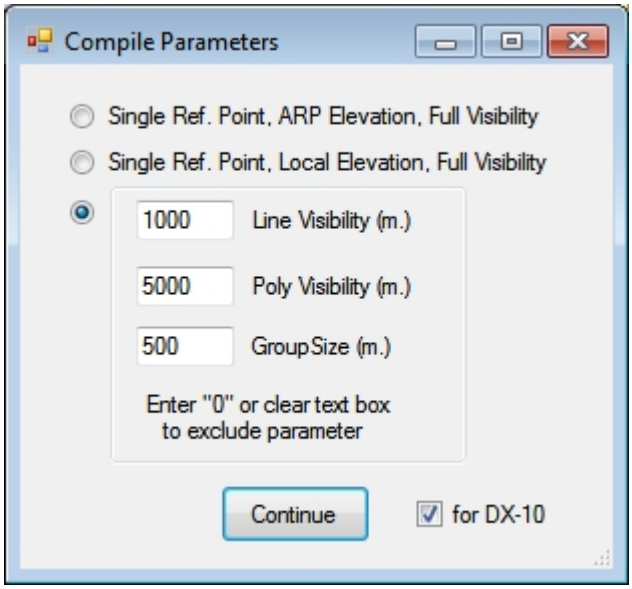
- the companion texture folder if the compiled files are placed in a folder named "scenery" or, otherwise
- in a folder named "Textures" at the same level as the compiled files.

Compilation involves converting your ground poly objects into a series of triangles at the elevation of a "reference point", saving that converted data ("tweaked" as usual for fs8-style ground polys) in a file in your ADE folder named *ADE_GP.asm* and then submitting that file to FlightSim's BGLC_9 compiler. Following successful compilation, a list of the textures used by the ground poly objects can be found in a text file in the ADE folder names ADE-GP_TexturesUsed.txt

The most troublesome aspect of ground polys is autogen suppression. As with any scenery object, autogen is suppressed within the "bounding box" of the GP objects. (This is a fundamental aspect of FlightSim and has nothing to do with ground polys *per se*.) The bounding box of a group of GP objects is the smallest X/Y-oriented rectangle that holds the objects. (On your ADE display, use the "rubber band" to visualize it. Thanks for that idea, Tom.)
  ```

When you select ADE's Compile Airport function, after specifying the destination folder you are greeted with the ADE_GP's Compile Parameters Dialog, shown below:
The dialog offers three basic compile options:

- Single Ref. Point, ARP Elevation, Full Visibility - compiles all ground poly objects using the elevation of your airport's ARP (the default situation). If you have only a small number of ground poly objects well away from your airports boundaries, this option should suffice. It is the most FPS-efficient and generates the smallest file.
- Single Ref. Point, Local Elevation, Full Visibility - compiles all ground poly objects using the elevation of the ground at their geographic center. If you have only a small number of ground poly objects well away from your airports boundaries but in a flattened area not at the ARP elevation, use this option.



Compiler Dialog

- Line Visibility/Poly Visibility/GroupSize - For complex, GP arrangements where FPS efficiency must be improved or where unacceptable autogen suppression results from using either of the preceding options.
    - Group Size (m.) - Instead of processing all GP objects as a single entity, ADE_GP breaks up your GP objects into groups of the size you specify. Primarily, this is a mechanism to minimize autogen suppression - by reducing the size of the bounding boxes around your GP objects (see below). But, this option is also helpful if all your GP objects are not at the same elevation; the elevation of the objects in each group is set as the ground elevation at the center of the group. As well, GP objects in a group are not processed by FlightSim until the group is "in range", improving FPS.
    - Line Visibility (m.) - Normally, lines are processed from whatever distance Flightsim processes scenery objects (e.g., the GP projects in a group). If the lines are too far away to be rendered in a meaningful fashion, this is a waste of processing resources which will adversely affect FPS. This entry allows you to specify the distance beyond which the lines in the group are not processed.
    - Poly Visibility (m.) - Similar to Line Visibility, but applicable to GP poly objects.

There is a trade-off in using groups, however. Groups themselves increase file size and processing overhead. The smaller the group size, the more groups created. Also, if line and poly visibility are different, the number of groups generated may be as much as doubled. So, group size and the visibility entries should be as large as possible. Some experimentation likely will be required for you to arrive at the best solution (for you.)

In very large and complex GP arrangements, all GP objects in automatically-generated groups may have a significant detrimental effect on FPS. To minimize the number of groups and, hence, the "FPS-hit", AFLT allows you to override automatic grouping for GP objects that don't interfere with autogen. To utilize this capability, on your ADE display, visualize the largest X/Y-oriented rectangular area (using a helper or "rubber band") that does not extend into autogen that you don't want suppressed. Then, edit each GP object lying entirely with the rectangle and assign them all the same group number. (Any positive integer may be used as a group number.) Repeat as necessary on other sections of the airport. You may find certain GP objects lie in two or more such rectanglar areas. If so, it doesn't matter which you assign. Do not include any object that extends outside these rectangles, since, even after partitioning, the entire object is assigned to the specified group. Only the remaining GP objects, i.e., those not assigned to a specific group, are automatically collected into small groups. Judicious use of this capability should reduce the FPS-hit to the absolute minimum.

The DX-10 checkbox is only enabled when compiling for FSX and when any night (_LM) textures are used. If the checkbox is enabled and you use DX-10 Preview Mode, check it. Otherwise, unless you are using custom shaders, during dusk, night and dawn, those ground polys to which a _LM texture is assigned will be displayed as solid white. (Of course, whatever effects were to be created by those _LM textures will not be rendered by FSX when this box is checked.)

Other than as noted in the previous section, you should never receive an error message from the BGLC_9 compiler unless you attempt to do something very unusual (and even then, any problems should be detected before you compile). But, should there be a compiler error, unless you are experienced in .asm coding and the inner-workings of BGLC_9.exe, the message is unlikely to be meaningful to you (and even if it is, there's nothing you can do about it). Just report it in the support forum.

Occasionally, you may notice a ground poly disappearing at certain viewing angles. This is thought to be due to slight differences between reference point elevation and the elevation of the ground at the location of the ground poly. The difference need not be large; a fraction of a millimetre is sufficient. Posts at fsDeveloper.com suggest this difference can be avoided by including an "elevation stub" that reflects your flatten elevation in Flightsim's *Scenery\World\scenery* folder. (You should first ensure any flickering is not due to an existing elevation stub that is not/no longer required.) Alternately, lowering your flatten elevation slightly may also help. As well, the author has noticed "ripples" near the edge of flattens which have resulted in ground polys being suppressed. So enlarging your flatten may also help.

As noted above, ground polys will only display properly when placed in flattened areas. If you place a ground poly at a location that has not been flattened or that has been flattened to other than the reference point elevation, the poly will not be visible if/where the elevation of the ground is higher than the reference point, or it will be "floating" if ground is lower.

As well, during testing, it was noted that when a single poly was placed distant from the Airport Reference Point, it may not display on some FSX systems at all. On other systems the same object may be visible in Top Down mode only when the eye-point is quite high; in this latter situation, the poly generally displays properly in other View modes. The cause may be as discussed above. Or, it may be due to earth's curvature. We don't know for sure. Should you experience this, placement of another ground poly object near the ARP may offer relief - or use a local center.

Texture Management

ADE includes a number of textures used by the author for his airports. The most frequently encountered line patterns are included as are a number of pattern for polys: walkway, crosswalk, cross-hatches, aircraft parking designators and automobile parking lot lines, and some useful text signs: RESTRICTED AREA, NO PARKING, etc. Most of these textures have a "alpha channel" to allow prominent characteristics of any underlying textures (e.g., cracks in pavement, rough surface) to show through. If this is not to your liking, adjust the alpha channel using image editing software (be sure you edit the textures in the *Textures* folder) or delete the alpha channel altogether (use DXTBMP or ImageTool).

These textures are delivered in the folders:

- *Textures_Base_Mipped,*
- *Textures_Base_NonMipped* and
- *Textures_Dpy_Base*

and the associated texture control files

- *Texture_Def_Base.txt* and
- *Lines_Def_Base.txt*.

These textures should be regarded as a "starter set". It's likely you'll need additional ones to make your airports "like the real thing". .

ADE_GP employs two working texture folders: *Textures*, which holds the DXT or 32-bit textures for FlightSim to use, and *Textures_Dpy*, which are what you see on the GP Editor when creating/editing ground-polys. The reason for two folders is that you cannot see patterns on textures that use an alpha channel to create those patterns and, in any case, Windows doesn't display DXT textures. So, *Textures_Dpy* contains a 24-bit version of each texture in the folder *Textures*. On the first execution of ADE_GP, the corresponding working folders/files are created - using the mipmapped texture set.

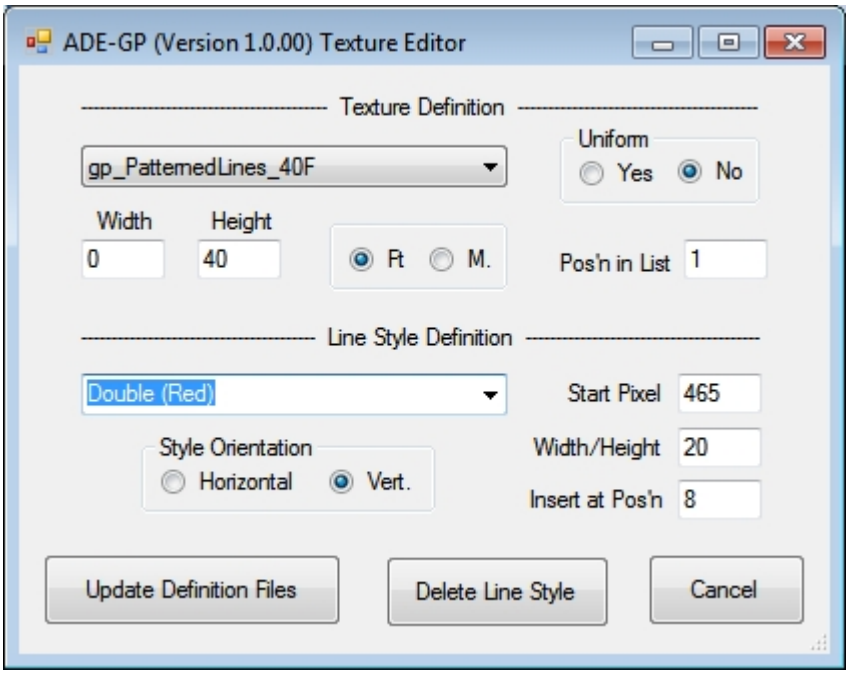
If you would like to use the non-mipmapped textures, overwrite the contents of *Textures* with the contents of *Textures_Base_NonMipped.* To propagate the non-mipmapped textures to any existing airport, simply recompile the airport(s)

Any updates to the original base textures will be delivered in updated *..._Base* files and folders. You should review these folders following update and extract and add to your working folders/files any new textures and control entries of interest.. In this manner, you working files will not be affected by updates to the base set - unless you want them to be.

If you wish to use *.dds* textures with FSX, you may do so by making *.dds* versions of the textures in the *Textures* folder (where required) and saving them there in addition to, or in place of, the *.bmp* textures. To propagate the *.dds* textures to any existing airport using *.bmp* textures, simply recompile the airport(s). However, you'll have to delete the previously-existing *.bmp* textures from the airport's *textures* subfolder by hand.

It's important you understand the ADE ground poly textures scheme so as to be able to successfully add your own custom textures.

To add you own textures, place a copy of the DXT or 32-bit version of the texture in the *Textures* folder and a 24-bit texture showing whatever you want to see in the editor in the *Textures_Dpy* folder. (See the two versions of gp_PatternedLines or gp_Patterns for examples.) If your texture has an "_LM" version, save it too in the *Textures* folder. Do not reduce the texture size of the files in the *Textures_Dpy* folder. Then from ADE's Tools menu, open the GP Texture Editor. (For new textures, the bottom portion of the dialog will be disabled and the fields blank - not as shown below.)



Texture Editor

In the upper left-hand combo-box, select the name of the new texture and specify:

- the distance (in feet or meters) the height and/or width of the texture is intended to cover. (both entries may be left blank if the texture is not distance-sensitive),
- whether the texture is of a uniform nature suitable for use as line-backing or ground poly outlining, and
- where in the Main Texture list on the GP editor you want this one to appear.

Finally, click on Update Definition Files

Then, if the texture is to be used for line styles, in the text box near the center of the dialog, enter the line style name (it may be any unique name) followed by <Enter> from the keyboard and then:

- the start pixel, i.e., the lowest or leftmost pixel in the style (note that the reference for this entry is the bottom left-hand corner of the texture),
- the width of the style in pixels,
- the style orientation (i.e., the direction in which a given line style proceeds) - horizontal or vertical; and

- where in the list of line styles on the GP Editor you want this one to appear.

As before, when you are finished, click on Update Definition Files.

The texture editor may also be used to modify the definitions of existing lines/textures and to delete textures and line styles.

Texture names are displayed in the two texture combo-boxes on the main Ground Poly Editor in the order set out in *Texture_Def.txt* which you may adjust to suit yourself. However, they are not displayed until they have been defined in Texture_Def.txt, either using the editor above or using manual methods described below. If the new texture is for patterned lines, an entry in *Lines_Def.txt* is also required. As before, the sequence of entries in *Lines_Def.txt* determines the order in which patterns are displayed in the pattern selector listbox. You may resequence these entries as desired.

To avoid confusion or potentially conflicting displays in the Texture Editor, textures should be saved in the *Textures* and *Textures_Dpy* folders before attempting to enter them into the definition files. Likewise, if textures are removed from the *Textures* and *Textures_Dpy* folders, they should immediately be deleted from the *Texture_Def.txt*, either manually or using the Texture Editor.

Note, however, to permit easy experimentation, every texture that exists in both the *Textures* and *Textures_Dpy* folders is displayed in the GP Editor's texture list, whether or not it has been defined in the definition files. Should this be the case, the GP editor displays and uses it as a uniform texture with horizontal and vertical sizes of "0".

Should you wish to modify the textures provided, it is recommended you make a copy and modify the copy, retaining the original under its original name. Otherwise, should we update/revise our textures, you would then have to re-apply your changes. Textures used by ADE-GP are standard FlightSim textures and must conform to all the usual requirements including, in particular, the need for texture sizes to be a power of 2.

While a texture editor is provided, manual editing of the definition files may be preferred by some users and indeed, for experienced users will be faster. Following is a description of the definition files.

The editor uses two text files to define how it should interpret/use the textures, namely:

- *Texture_Def.txt* and
- *Lines_Def*.txt

There is one entry in *Texture_Def.txt* for each texture to be used by the editor. That entry is in the form:

texture_name | *horizontal dimension* | *vertical dimension* | *uniform texture flag*

Texture name and one of *horizontal dimension* or *vertical dimension* must always be specified.

- *Texture name* is the file name of the texture sheet; do not include the file extension; however, case need not match.
- *Horizontal dimension* and *vertical dimension* specify the horizontal and/or vertical distance covered by the texture. You would make this/these entries if you wanted the texture to be interpreted as covering only a certain distance in one or both dimensions. If only one is specified, the other will be calculated based on the aspect ration of the texture sheet. If neither is specified, the size assigned to the texture will be just sufficient to include all vertices - preserving the aspect ratio, of course. The specification may be in feet, in which

- *Uniform texture flag* is to indicate which textures are suitable for use in poly outlining or line backing. It should be either "True" or "False". If not "True" - or is missing - it will be deemed to be "False".

Lines_Def.txt tells the editor the patterns that are available, on which texture sheet they reside and where on that texture sheet they are located. This file includes an entry for each available line pattern in the form:

pattern name | *texture name* | *offset for start* | *width or height of line* | *size of texture*

- *Pattern name* may be any unique name, but should be descriptive since that's what you'll see in the line-pattern selector list.
- *Texture name* is as in *Texture_Def.txt* above
- *Offset for start* is the number of pixels from the texture origin to the start of the line pattern. The value must be preceded by "U=" to indicate a horizontal offset (in which case, the pattern is assumed to run vertically and the offset is to the left edge of the pattern) or "V=", for a vertical offset (in which case the pattern is assumed to run horizontally and the offset is to the bottom edge of the pattern).
- *Width or height of line* is the number of pixels from the offset to the other edge.
- *Size of texture* - the number of pixels along the side of the texture sheet for which offsets are specified

Should you want to make lines that exactly match the stock taxiway markings, copy the texture *taxiway_marks.bmp* from your FS9\Textures folder into the ADE *Textures* folder, or make a DXT5 .bmp version of *taxiway_marks.dds* from your FSX\Textures folder. A 24-bit version of this texture is already in *Textures_Dpy* and the *Lines_Def.txt* and *Textures_Def.txt* entries already exist.

Importing Ground Polys

Those of you who have previously created FS8-style ground polys for your airport using Gmax and FS8 MakeMDL (or some other set of tools) may now wish to integrate those ground polys into your airport AD3 file. ADE allows you to do this using the Import Ground Polys function under the File menu.

First, ensure that all required textures are available in your Textures and Textures_Dpy folders. (ADE_GP won't import any objects from a file unless all required textures are available in those folders. It will, however, list the texture files that are missing.) Then, for each file to be imported, click ADE's File / Import Ground Polys menu item, navigate to the .asm file (not the _0.asm file) - tweaked or un-tweaked - containing the ground polys and click Open on the File Open dialog. (If un-tweaked, you'll be asked to specify the layer number to be assigned.) Your ground polys should immediately appear on your ADE display.

The importer is not perfect. It attempts to re-create lines and polys from individual triangles. However, it has no reference for doing so other than the position of the vertices comprising the triangles as generated by Gmax and MakeMdl and the sequence in which it encounters those triangles. So, what you created as a single large poly may be imported as several smaller components. And what you considered to be a line may be imported as a poly and vice versa.

As well, sometimes when you create a 4- or more-sided plane with GMax, Gmax will handle it - or some portion of it - as individual triangles. When this happens, unless Gmax keeps them

sequential in its output, the ADE_GP importer will not be able to re-establish their relationship and they will be imported as separate triangles.

Finally, very complex objects may be imported in a manner that cannot be compiled because the order of the vertices resulted in a poly that overlaps itself. This situation will be detected on your first compile and you'll have to "unwind" the poly on the ADE screen before it will compile. Sometimes, it may even be necessary to delete and replace a few vertices

ADE_GP considers any rectangular object (two adjacent right-angle triangles) with an aspect ratio of at least 3:1 and a width not exceeding 5 ft (1.5 m.) to be a line. Also any series of adjacent 4-sided objects each with two parallel sides separated by not more that 5 ft (1.5 m) is considered a line. Otherwise, the imported shape is tagged a poly.

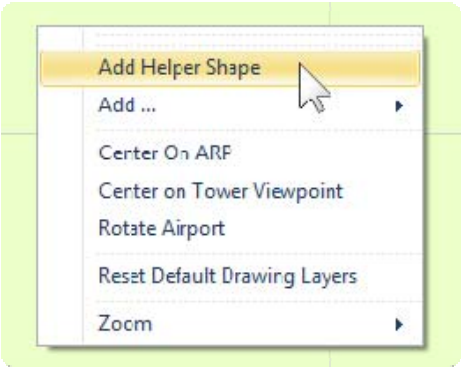
These idiosyncrasies are only of consequence if you intend to edit the object and want the individual elements to be handled as a single object. Then, you must first combine them into a single ADE GP object. Otherwise, the individual elements will be rendered in FlightSim as they were before. Also, if you edit lines, you will have to re-establish their placement on the texture. (So long as you don't edit a line, the previous texture placement remains intact.)

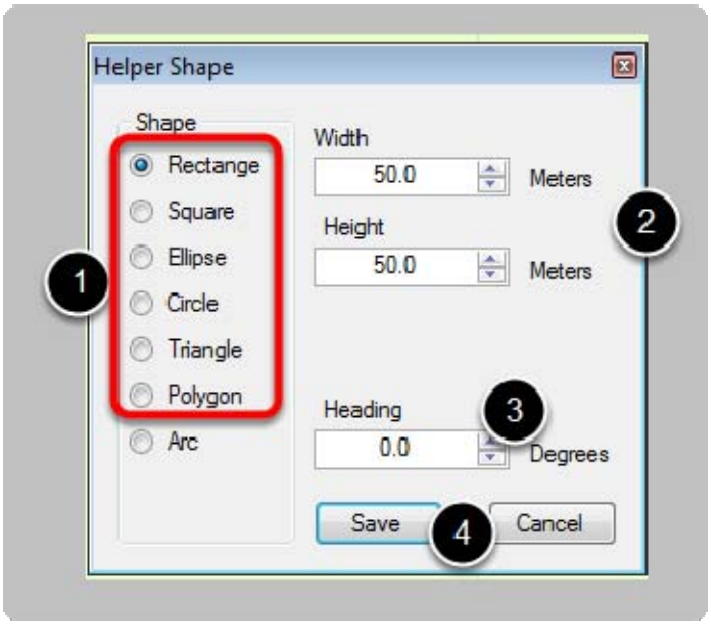
Before you attempt to change any aspect of an imported GP object, e.g., add, delete or change the position of individual vertices, it is important that you open the object in the ADE_GP editor first and save it before making such changes. Otherwise, the ADE display of the revised poly may be distorted. (Not doing so will cause no permanent harm. A simple "reset" in the ADE_GP Editor is all that is required to recover, but you likely will have to touch-up the texture placement is using a non-uniform texture.) An unedited, unmodified, imported object will compile and be rendered properly in FlightSim.

Occasionally, ADE will report an imported object that cannot be compiled and identify its bounding box latitudes and longitudes. While its possible ADE_GP may be unable to handle certain complex polys, it's more likely, they are tiny artefacts. Which is the case can easily be determined by checking the ADE display in the vicinity of the reported location. If the display is as you intended, it's an artefact and can probably be deleted or ignored. (Often these artefacts are so tiny that they cannot be located on the ADE display. You may be able to locate and delete them using ADE's list functions.)

Using Helper Shapes

ADE has a number of helper shapes that can be used to create objects like aprons or custom ground lines and polys. To add a helper shape use Right Click > Add Helper Shape.





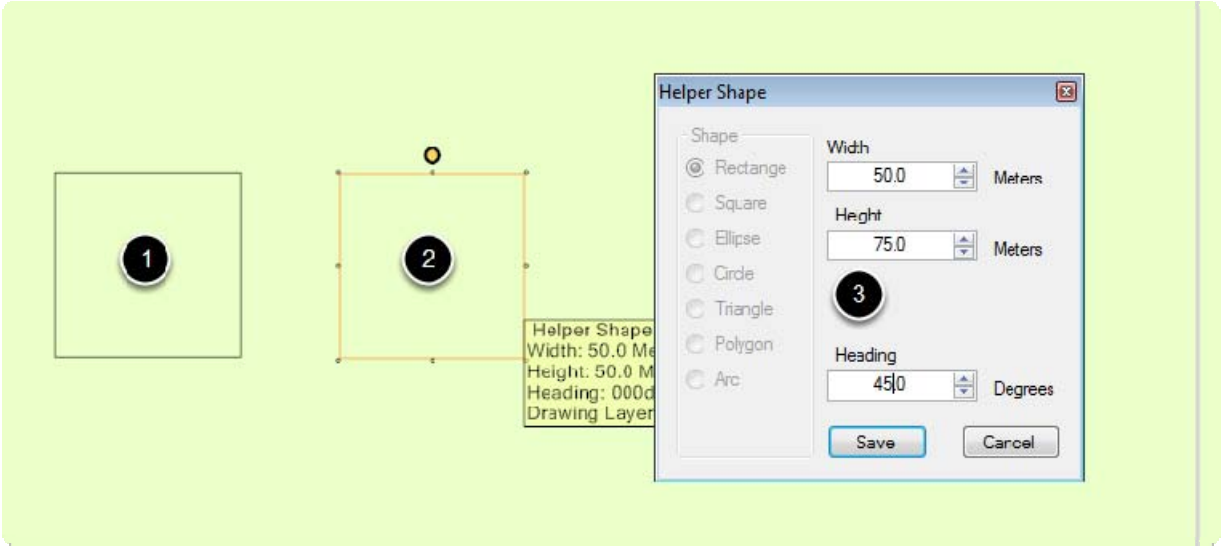
A few things to know about ADE helper shapes:

- helper shapes can be turned into custom ground poly objects;
- most aspects of helper shapes, including heading, can be controlled by you;

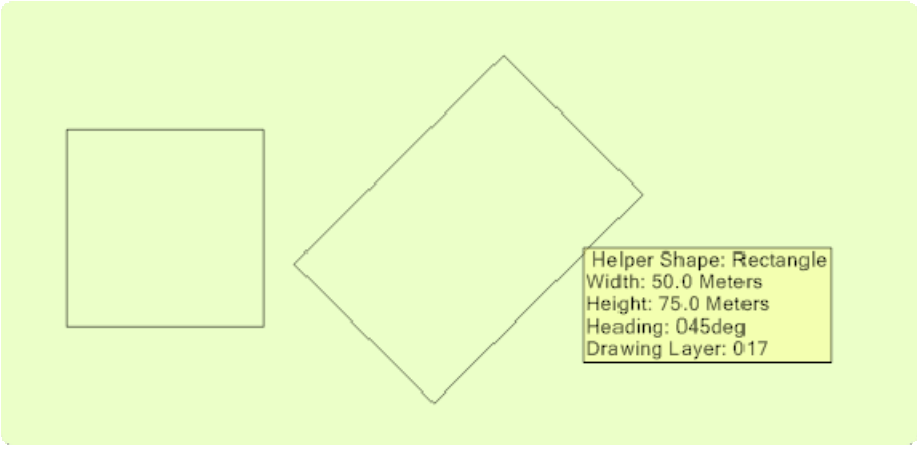
when you save a helper shape, you create a GP object of the same shape.

To edit the helper shape:

1. When created a helper shape is displayed with a black border
2. Select the helper shape to move it or use the handle to change the heading. If you have a ProKey then small handles around the object allow it to be resized. Without the ProKey the helper can be re-sized using the keyboard.
3. Helpers can be edited in the same way as other objects and the Helper Shape property dialog. You can change all the properties except the shape type. In the case below, the height and heading have been updated.

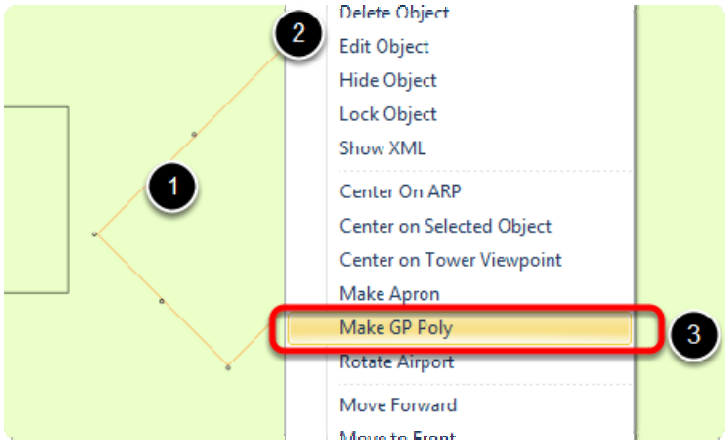


The shape is updated

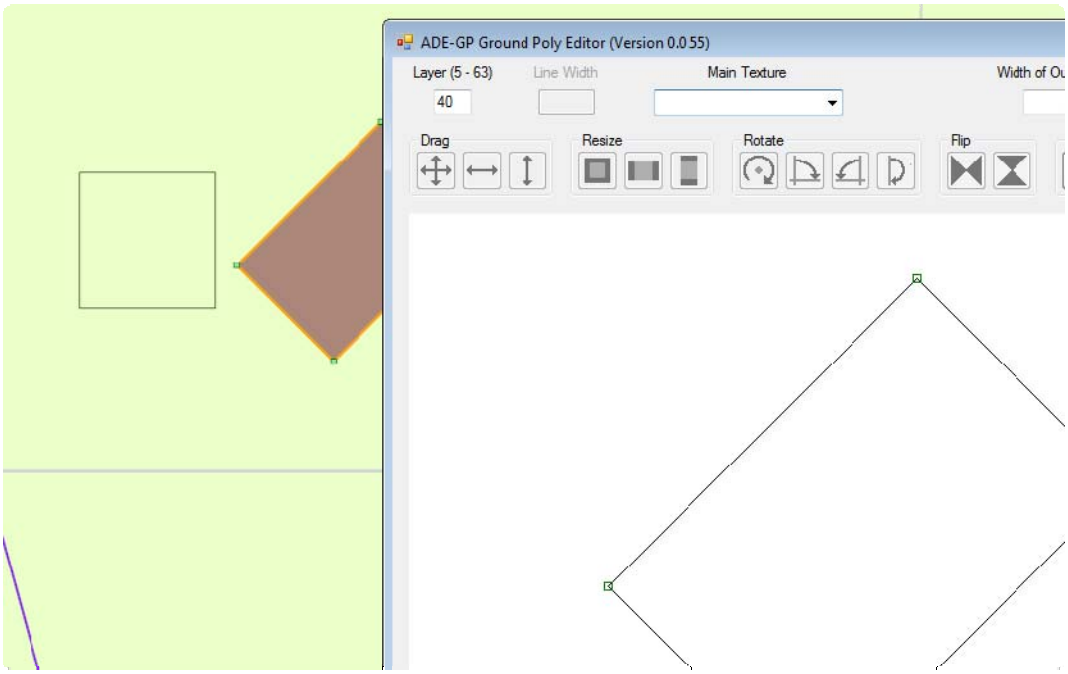


Create a Custom Ground Poly from the Helper Shape

1. Select the Helper Shape
2. Right Click
3. Select Make GP Poly

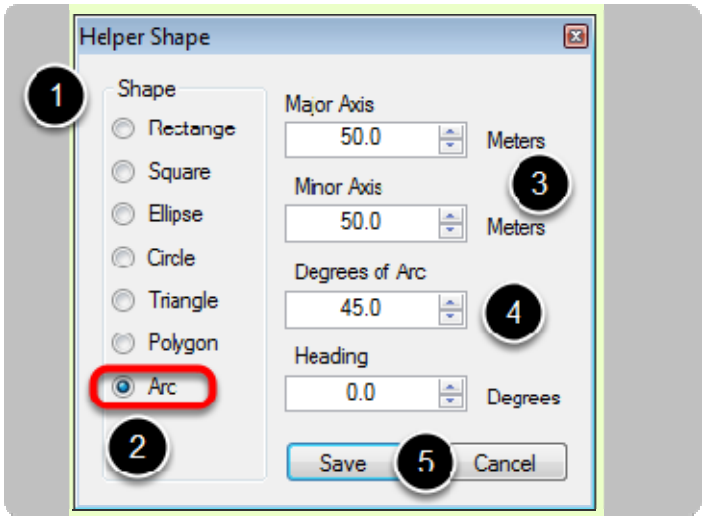


The Editor will open so that you can set the required properties

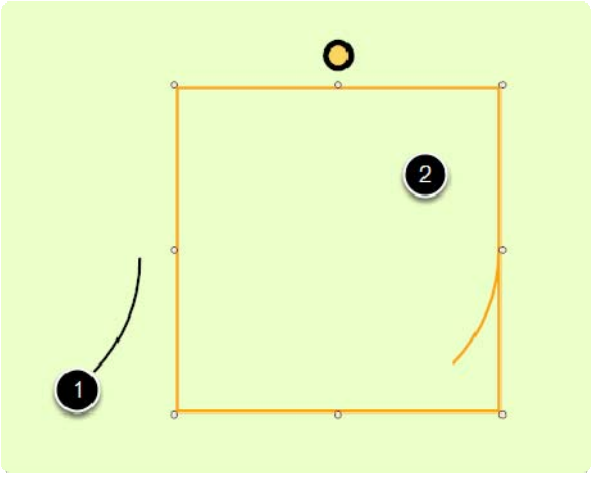


Create Custom Ground Line from Helper

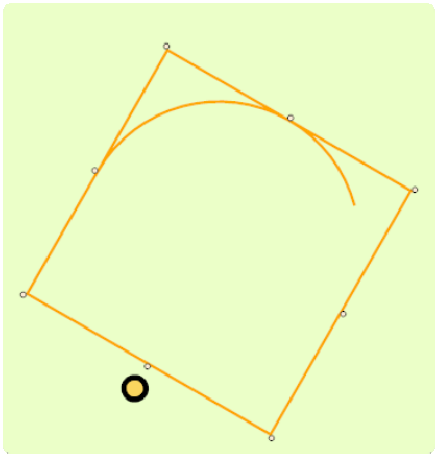
1. Use the right click menu to add a helper shape
2. There is currently only one shape available that will create a line - the Arc
3. The size properties are changed to allow you to enter the sizze of the major and minor axes. For an arc based on a circle keep these the same
4. A new property is displayed to enter the degrees of arc
5. Click Save to create the helper or Cancel if you change your mind



1. The helper is drawn as the arc you define
2. A selected arc shows the bounding box that was used to create it. In this case we can see that the arc is drawn over just 45 degrees
3. The arc properties can be edited as for other helper shapes

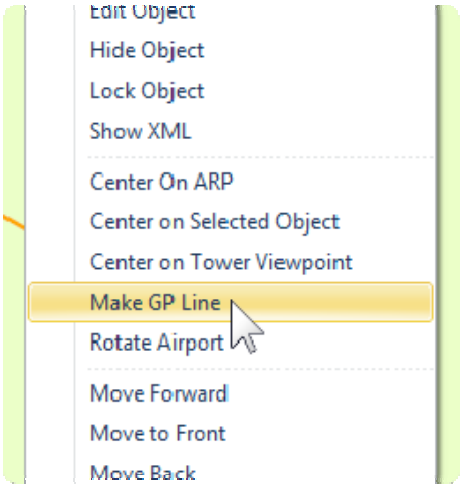


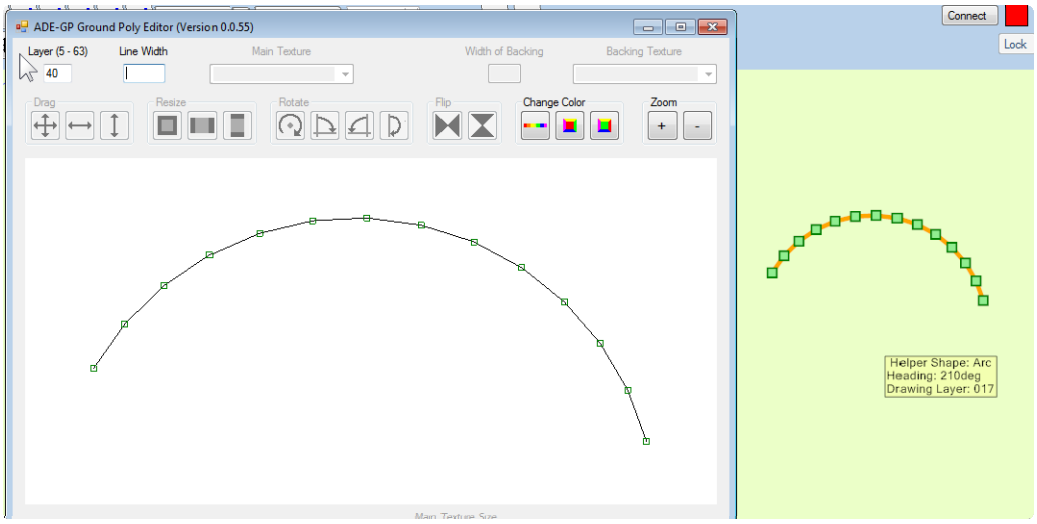
This arc has been edited to give an arc of 135 degrees at a heading of 210 degrees



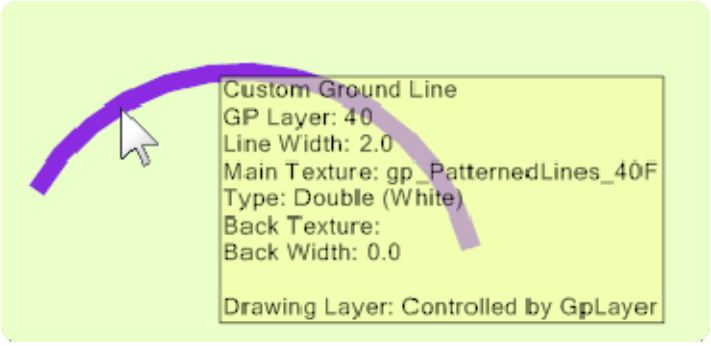
Create Custom Ground Line from Arc

1. Select the Helper
2. Right Click and Make GP Line



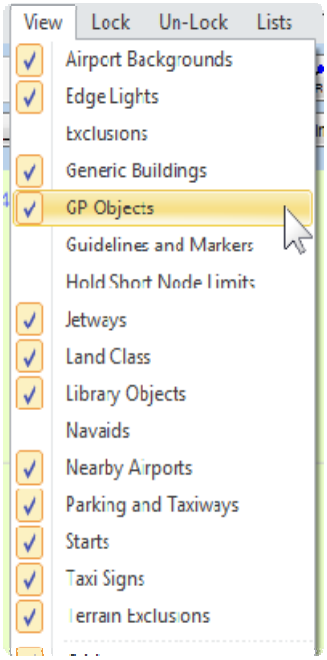


The Custom Ground Line is created based on the properties set in the editor



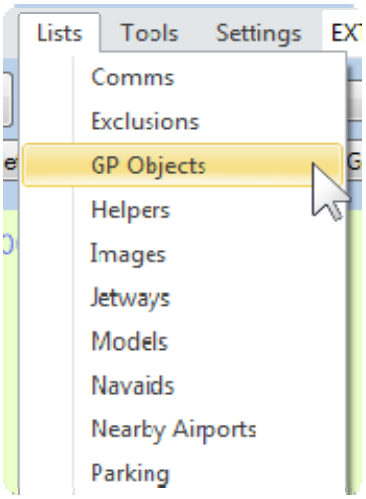
View GP Objects (Custom Ground Lines and Polys)

These can be shown or hidden in the display via the View Menu

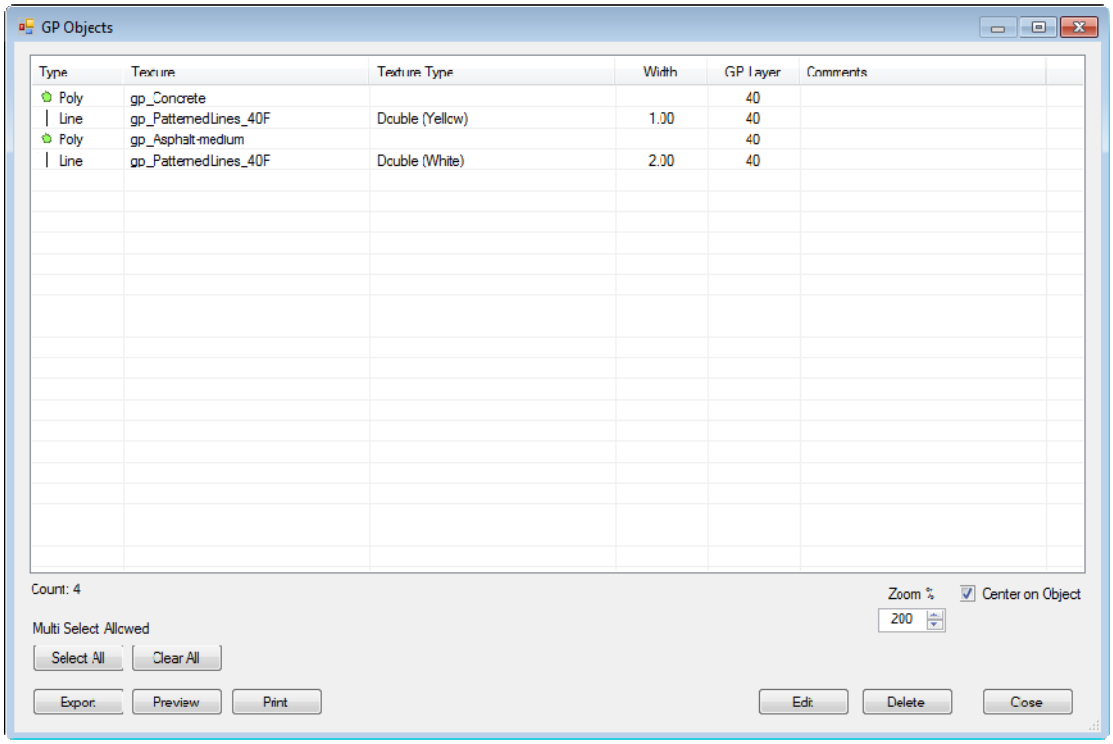


List GP Objects

Use the List menu and select GP Objects



The list displays all the custom ground lines and polys in the project. You can edit or delete these from the list.



A Few Words about Ground Poly Layers

While FS9 does not support user-drawn ground polys other than those with the "fs8-tweak", it uses the ground poly layering system extensively.

Following is a summary of the layers used for FS9 stock airports:

Layer	Description
7	Airport polygons
8	Shorelines
7	Parks, golf courses, etc.
6	Roads
5	Railroads
4	Rivers/streams
4	Utilities (pylons)

Ultimate Terrain does things a little differently:

Layer	Description
6	Road flattening – all other roads
6	Road flattening – major roads only
8	Coastlines
4	Cemetery land polygons
4	Golf course land polygons
4	City park land polygons
6/8	Minor roads in urban areas
6/8	Roads as bridges
6/8	All roads except minor roads in urban areas.
6/6	Railroads
6/6	Roads as tunnels

Any other FS9 add-ons that supply roads and/or terrain may use different layering again. Your ground polys will be "competing" with those already in place. Fortunately, the worst that will happen is that your ground polys may unexpectedly cover or be covered by others in the scenery and that's (now) easy to fix.

FSX uses an entirely different scheme for roads/terrain etc. So you will only need to be concerned about your own work.

Higher-numbered layers cover lower-numbered layers. Line backing and poly-outlining use the layer immediately prior and following the layer assigned to the line or poly respectively. Ground polys that do not intersect may use the same layer.

The ADE ground poly feature allows you to use all layers between 5 and 63, inclusive, so you've got lots of flexibility.

Happy "ground-polying"!!

Appendix "A" - Autogen Suppression by Ground Polys

Autogen suppression by ground polys is unavoidable! But, it is controllable. Since autogen suppression played such a significant role in the testing of ADE_GP, I felt some discussion was warranted

There are (at least) two types of autogen suppression by ground polys.

1. The first and easiest to understand is suppression within the bounding box. Whenever a scenery object is placed in FlightSim, autogen is suppressed within its bounding box, that is, the smallest rectangle - oriented in the cardinal directions - that can contain the object. In the case of ADE_GP, the object is one or more ground polys. Obviously, if your ground polys are not oriented in cardinal directions, the bounding box will be larger than if they were and extra autogen will be suppressed. To combat this, ADE_GP will divide your ground polys into groups for which the largest dimension of the bounding box will not notionally exceed the Group Size you specify. The descriptor, "notionally", is important, however, since, if the size of a ground poly exceeds the entered Group Size, the bounding box will be based on the actual size and orientation of that ground poly. For this purpose, each segment of a line is considered a separate poly and, for FSX and P3D, ground polys that exceed 100m in any dimension are automatically subdivided into 100m (or less) "chunks". While, technically, it would be possible to subdivide ground polys into even smaller "chunks", the need to do so should be infrequent and, in any case, an obvious manual solution is available.
2. The other type of autogen suppression is less well understood. It can result in wide swaths of missing autogen in areas not even bordered by ground polys. But it is definitely caused by the ground polys; remove the ground polys and the autogen returns. This type of autogen suppression can be avoided with the judicious use of the "dummy Scale" command, i.e., a SCALE_AGL command with all its fields set to 0 (For further information on dummy Scale commands and some history on the topic, please refer to this fsDeveloper forum thread. To avoid this type of autogen suppression, a dummy Scale command should be placed at the end of the code block called by each ADDCAT command, just before the BGL_RETURN statement. Unfortunately, use of dummy scale commands can lead to flickering of ground shadows. To avoid flickering, add a block of data and code as if you planned to place additional ground polys. The associated latitude and longitude references should reflect the entire area covered by ground polys. The layer argument of the ADDCAT command must be a number higher than any layer used by the ground polys. (This implies 62 as the maximum useable GP layer.) The code block called by the ADDCAT command should contain nothing but a BGL_RETURN statement, i.e., no dummy scale command. This autogen suppression prevention block my be placed in the same file as the ground polys or in a separate file. What's important is that it specify a layer number higher than any used by the ground polys.