

FSTflatten: A utility for creating complex flatten polygons in bgl format for FS200x

Files included:

FSTflatten.exe	automates creation of flatten bgl files
flatten.ini	provides the default settings
flatten.txt	empty text file used to store Area data
BGLheader.dat	database of FS2002 hyp*.bgl files (water)
scasm.exe	creates the final bgl file
h_move.cur	the cursor image displayed when moving the Map
readme-FSTflatten.doc	this document

Quick Start (Area16N method)

Run the applications:

1. Start Flight Simulator and run it in Window mode. Reduce the window size so you can position FSTflatten at a convenient location on your screen.
2. Start FSTflatten. You will receive a warning if Flight Simulator is not detected. You can continue to use the application to create bgl files, but data from the simulator will not be available. You can connect to the sim after it is started.

Prepare to add data:

3. Click the <New File> button to delete the current flatten.txt file.
4. Enter a title for the Area. This will be used to name the bgl file so standard Windows filename conventions apply. Do not include an extension.
5. Enter the desired Elevation, in meters (decimals ok; you can enter Elevation in feet, then double-click the field to convert to meters).
6. Click the <New Area> button to add the Area Name and Elevation to the flatten.txt file. The <Add Vertex> button will warn you if you try to add vertices to a non-existent area.

Collect the vertex coordinate pairs:

7. Position the aircraft at your first vertex for the Area to be flattened.
8. Click <Add Vertex> to append the current coordinates to flatten.txt. A large dot marking the location of the stored position is added to the Map view.
9. Reposition the aircraft and repeat steps 7 and 8 until you have defined your Area. Do not end with the starting point, the software closes the polygon for you. A "cursor" will move over the Map area to reflect the position of the aircraft.

==> Be sure to move in a Counter-Clockwise direction when defining the perimeter of your Area
<==

10. Return to step 4 to add additional Areas.

Create the flatten bgl:

11. Click the <Create bgl(s)> button to create your files. Close the DOS window when the DOS window Title bar says "Finished".

International Users:

The current version assumes Windows is configured to use the "." (period) as the Decimal Symbol.

BGL file installation

move the file(s) to your ADDON SCENERY\scenery folder
(FS will use them by default if Addon Scenery is checked in your Scenery Library)

or,
create another folder, with a \scenery subdirectory; e.g. ADDON SCENERY\flatten patches\scenery\
move the bgl file(s) there, then "Add" your new folder to FS using the Scenery Library menu.
(once this folder is Added, new patches need only be moved here, no additional action is required.)

or,
place the bgl files in the same folder as the scenery you wish to flatten

Details

Terminology:

Point - the coordinates of the aircraft
Path - a collection of Points, indicating the path of the aircraft
Vertex - a location stored as a corner defining the boundary of the Area to be flattened
Link - the lines connecting the Vertices for the Area
the software draws an additional link between the last and first Vertices for you
These Links enclose the area that will be flattened

The application window has a menu and six functional regions:

*** Menus**

Settings: The Settings options provide some customization of the way the application works.

Play Sound - By default, a sound file is played when you press the <Add Vertex> button, providing helpful feedback when working quickly. Uncheck this option to turn off the sound.

Plot Path - By default, the application plots Points along the path as you move the aircraft. If this is distracting, you can uncheck this option to turn off all plotting of Points (and the Path they generate).

The data is still captured, it is just not plotted. You can turn this back on and Redraw the Map to see the Path at any time.

Show Counter - Toggles the display of the number of Points in the Path for the current Area.

Show All Areas - By default, only the Links connecting the Added Vertices for the current Area are displayed. Check this option to include all previously defined Areas as well. These are plotted using a different color. This is useful if you are creating several flatten files in an area, either adjacent or overlapping.

Show Area Numbers - Adds a number next to each area except the current one. These numbers represent the sequence in which the Areas were Added.

Show Grid - Toggles the display of LOD quadrant grids.

Coordinates as DD MM.mm - Toggles the format of the coordinate displays

Default menu Settings values are stored in the flatten.ini text file, which is read when the application is loaded. You can customize the startup configuration with your preferred settings by editing these values (0=off / unchecked, 1=on / checked) The Settings menu options are updated to reflect these values. The order is not important.

The parameters supported here are:

sound	sound played when vertex added
path	plot path as aircraft moves, and when Map is redrawn
areas	show all areas when Map is drawn / redrawn
numbers	print area sequence number with non-current areas
counter	display the Path Point counter
grid	display the LOD quadrants
lod	the LOD used to define the grid spacing
delay	controls speed at which current area links are drawn (milliseconds)
coords	determines the formatting of displayed coordinates

Grid LOD: Select the LOD size displayed by the grid lines.

Method: Select the method you wish to use to create your bgl file. This option determines how the data is stored in the txt files. The current method is indicated in the Window Title.

* Area

To create a new file from scratch, click the <**New File**> button. This action deletes the existing file.

The two fields here are used to store the name and elevation for each Area you wish to flatten. You can edit these files manually if desired. Since all data is appended to the files, you can Exit the application at any time and resume entry at a later date. The flatten.txt file (if present) is reloaded when the application is started. One Area must be Added before you can add vertex locations.

See the "**Now, about those methods**" section below for more information about how these fields are used.

When you are finished defining the areas, click the <**Create bgl(s)**> button (Area16N method only) to create individual bgl files for each Area. When finished, the program creates a backup copy of your

flatten.txt file with the name of the first Area in the file. The temporary *.sca files can be deleted when you are satisfied with your results.

See readme-bgl-asm.txt, in \bgl-asm, for more information about the LWM method and the additional steps required to create the bgl files.

* Map Management

The default Scale of the map is 1/4 degree. This is the width and height of the area included in the Map, with the aircraft at the center when the application is started.

Press the <**Zoom In**> or <**Zoom Out**> button to adjust the scale to fit the size of the area you are working with. These adjust the Scale by factors of 1/2 and 2, respectively. The Map is redrawn each time you click one of these buttons.

If you need to move the aircraft beyond the boundaries of the Map, use the <**Recenter Map**> button to reposition the aircraft in the center of the Map. (or, adjust the Scale)

In addition to using the <Recenter Map> button to position the aircraft at the center of the Map, you can use the mouse to reposition the Map. Press and hold the left mouse button to drag to Map to another location. The cursor changes to a Hand, indicating that you are in "move" mode. Release the mouse button at the desired location. The mouse cursor returns to normal and the Map is redrawn at the new location. You can replace the "move" cursor with one of your own by copying it to the application folder and renaming it to "h_move.cur".

The <**Link Vertices**> button connects the Vertex coordinate pairs for the current Area. These are drawn automatically for other existing Areas defined in flatten.txt.

The <**Redraw Map**> button redraws the Map, without the current Area Vertex Links.

The <**Clear Path**> button resets the path array counter to 1 and Redraws the Map with only the current position indicated. This is useful if you have cluttered the screen while gathering information.

* Map

This Map view of the path of the aircraft and stored coordinate pairs helps keep track of your progress.

The position of the aircraft is indicated by a red dot, the Path is plotted as a series of magenta dots. If you slew slowly, these appear as a continuous line. When a new Area is added, the vertices of previous areas are linked by black lines.

* Mouse Position Information

As you move your mouse over the map region, the coordinates are displayed at the left top of this area. This is for information only, and is not used by the application. Below the coordinates, the identification of the underlying LOD 8 Cell and LOD13 Area are displayed, in long, lat order.

Information about the *.bgl file covering the area under the mouse is displayed on the right side of the area. The name of the bgl file is displayed at the top. Beneath the filename are the boundary coordinates of the area covered by the bgl file. If there is no bgl file for the location, "N/A" is displayed. (These files define the fixed-elevation bodies of water/airports in the sim, so they are not present for all areas, especially beyond land masses.)

* Aircraft Position Information

Real-time Information about the terrain under the aircraft is provided here. As you slew the aircraft over the terrain, the current Ground Elevation and coordinates are updated. These coordinates are the values stored in the flatten.txt file. There are two values reported for the Elevation: actual meters the left and whole meters and fraction of a meter (in 1/128 meters) - the values needed for the asm file. Press the <Add Vertex> button to store the current position as a vertex for the Area in the flatten.txt file (Area16N method only).The bottom line in this area displays the coordinates of the individual AreaPoints. These values are useful for making minor adjustments in the bgl-asm.asm file.

* Application management

The button on the left has 3 states:

* If connection to the Simulator is successful when the application is started, this button Caption will be "**Pause**" and data retrieval begins automatically. A counter to the right displays the number of coordinate pairs currently recorded along the Path.

Press the <Pause> button to pause the retrieval of data from the Simulator. The Caption will be changed to "Start"

* Press the <Start> button to resume retrieval of terrain information. The Caption will be changed to <Pause>.

This feature is useful to reduce the amount of data stored while you are doing other things, and allows you to move the aircraft around without plotting a distracting path.

* If the application is unable to connect to Flight Simulator or loses the connection while in use, you will receive a warning and the Caption is changed to "Connect". You can restart the Simulator and click <Connect> to establish/restore the connection and resume data retrieval.

The application can store a maximum of 65535 coordinate pairs along the aircraft path. When this limit is reached, the counter is reset and the Map is redrawn. Previous Path information is lost. (Same a clicking the <Clear Path> button.)

Press the <Exit> button on the right side of the window to close the application.

Now, about those methods

The same interface is used to collect data for both. They differ in how and where the data is stored.

Area16N: appends all data to the flatten.txt file.
LWM: appends all data to the bgl-asm.txt file.

The process for data collection differs slightly.

Area16N: click the <Add Vertex> button to record the Vertex locations as you slew around each feature.
LWM: slew around the feature to draw the Path which defines the feature, then double-click the Areas crossed over by or enclosed within the Path. (Be sure Plot Path is turned on before you begin.)

The output files also differ.

- Area16N: a separate bgl file is created for each feature (area).
- LWM: a single bgl file is created for all the polygons in a source bgl file.

When you select the LWM method from the menu, the name of the current bgl file is entered in the Area field. If more than one bgl file is included in the Map area, you will have to move the Mouse off the Map area over an edge that leaves the correct bgl filename in this field.

Data collection:

1) Enter a brief description of the Area (optional for the LWM method), and the desired elevation, in meters.

The elevation can be entered in feet, but must be converted to meters before continuing. Double-click the field to multiply the field value by 0.3048, the feet => meters conversion factor.

LWM: since the asm file stores all polygon data for an Area in one block, all polygons in an Area will be set to one elevation. If there are multiple lakes in the area, use the elevation for the largest (most vertices). This will minimize the amount of manual editing required later.

2) Press the <New Area> button to enter the data in the text file.

- Area16N: appends both the area identification and elevation to the flatten.txt file.
- LWM: appends only the area identification to the bgl-asm.txt file. You can use this feature to insert multiple comments. For example, enter the name of the bgl file at the beginning, then insert each area description as you proceed.

3) Record the locations:

- Area16N: press the <Add Vertex> button to append a line with the latitude and longitude of the aircraft.
- LWM: double-click on each LOD13 Area to append a line with the Cell, Area, and Elevation data (the elevation entered in Step 1 is used for each line here.) Be sure the Grid LOD value is set to 13 so you can identify the Areas correctly. Including empty Areas will do no harm, so this process does not have to be very accurate.

4) Repeat steps 1 through 3 for each additional Area.

5) Create the bgl file(s):

- Area16N: Click the <Create bgl(s)> button, close the DOS window when finished, then install the bgl file.
- LWM: The LWM method requires additional processing. See the readme-bgl-asm.txt file in \bgl-asm for details.

Example txt files:

flatten.txt, created using the Area16N method:

```
#area 1
2872
54.4532350865698 -3.28421582349165
54.4482536331136 -3.29403971821336
54.4296702185852 -3.32490299914909
...
```

```
#area2
1560
44.3350089632904 -74.3920073442187
44.3350535451493 -74.3936891020941
...
```

bgl-asm.txt, created using the LWM method:

```
#hyp544124.bgl
```

```
#area 1
377 101 1 3 100 0
377 101 0 3 100 0
...
```

```
#area 2
376 101 31 3 100 16
376 101 30 3 100 16
...
```

the values entered are: cellX cellY areaX areaY Meters MetersFraction
all 6 values are required
the units for MetersFraction is 1/128ths of a meter, so 16 means 16/128 meters
blank lines are ignored

Miscellaneous Notes

When the application starts, it reads the flatten.ini file and configures the Menu. It then reads the values stored in the flatten.txt file. This means you can shut down the program, restart it later, and continue with your work. You can also edit the flatten.txt file to make adjustments before restarting. For example, fine-tuning elevations. You can also rename archived *.txt files and work with them. This does slow the loading of the application a bit, depending on the size of the flatten.txt file.

The Map view is for information only. The actual data recorded is the value of the Latitude and Longitude displayed near the bottom of the form. Screen resolution and variable precision in VB limit the accuracy of the display, especially when Zoomed in to higher resolutions.

The txt files are closed between updates, so you can view and edit it at any time. Just be sure to close it before continuing.

The information from the simulator is updated at fairly regular intervals. On my PC, there are about 1000 Points recorded per minute with the aircraft at rest, and about 550 Points per minute while slewing. Add-on mesh and Autogen levels do not seem to have any impact on this rate. If you slew the aircraft rapidly, there will be more space between the Points in the Path, creating gaps.

Area names - use unique naming conventions to help identify these files later if added to folders with other types of bgl files. I add a "#" character to the beginning of the Area name to identify the start of a new Area when processing the data. If you edit the file before processing it, be sure to include these.

You may include a maximum of 128 Areas per file and a maximum of 512 Vertices per Area. A separate bgl file is created for each Area. (These limits are arbitrary. Let me know if you need more.)

The resolution (the smallest area you can flatten) is determined by the resolution (LOD) of the underlying mesh. For example, LOD10 mesh has a spacing of 38.2m. You cannot flatten an area smaller than 38.2m in this area. The slope between the flattened area and the underlying mesh also depends on the LOD. Higher LOD mesh will produce steeper slopes. FS2002 and FS2004 render the flatten bgl areas somewhat differently. Since the flattened area is constructed using rectangles, lines not aligned with parallels or meridians will be approximated, creating a jagged edge in most locations.

If you have any problems creating the *.bgl files, check the associated *.sca (text) files to confirm that the data is entered and interpreted correctly.

By default, Flight Simulator Pauses when switching tasks; you will have to hit the P key to continue after returning to the sim window. This default behavior can be changed in the sim menus.

The use of the intermediate text files to store the data makes this a very flexible solution for flattening terrain. We have only discussed the most basic approaches here.

Known Issues

The precision of the data reported for the Mouse position depends on the Scale. If you need greater accuracy, Zoom in first.

Contact Information

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