# **DSF BOURTER DSF BOURTER DSF BOURTER DSF BOURTER**





# **DFSbuilderV 1.0**

Distribution Scenery Format Builder

# What is DSFbuilder?

### **Distribution Scenery Format Builder**

Is a Manager and helper on the construction process of the Mesh Terrain (\*.dsf) generated by the Meshtool program for X-plane, 10 and 11 versions. The Meshtool for your time is a development tool available for free by Laminar Research X-Plane, which through the command line in the DOS prompt is able to compile files using existing database in DEM (Digital Elevation Model), in format \*.hgt, \* .tif, combined with the format \*. XES (Land Classification or Landclass).

To use the Meshtool by the traditional way is very boring. Enter repetitive commands line in DOS prompt, instructing the PC to read and interpret data from digital models of terrain (hgt or tif) combined with terrain classification model, in addition to submitting a script (SCP.txt) programmed by the user according to your need in the construction of the scenery. Manually is a dull task, which usually raises obvious typing errors. The **DSFbuilder** is a facilitator of this process, ideal for those who want to generate mesh terrain sceneries in X-Plane quickly and quite comfortable, without extensive typing command lines in the case of building large areas.

# What makes DSFbuilder?

Automates the process of creating the repetitive tasks of the Meshtool command creating DSF format files (Distribution Scenery File), organizing them geographically in the respective folders equal in X-Plane 10 and 11. Assists in editing of the script, which in DSFbuilder is already a preset editable named SCP.txt file that can be edited through a window in the DSFbuilder, allowing to modify and save according to the needs of the developer. The DSFbuilder also creates HGT.log and XES.log files, which are HGT data files that are with problems at the source. For example, if the user has 100 \*.hgt files compiling and one of them contains error, the DSFbuilder will report points to be patched and recompiled in isolation.

# What you need to do?

It is known that before generating a mesh literally speaking you must acquire all necessary data and put together a well-written, well calculated Dataset and well dimensioned, downloadable from reliable sources with guarantee that the necessary files are free of errors.

The first step, after the delimitation of the area chosen for the creation of the scenario is to get the necessary files with the extension \*. xes (land classification), free at the website X-Plane Developer, also the SRTM files, in the form of HGT, or extension GeoTif, which you can download free from various websites of satellite data from the Internet, which will be listed later in this document. In addition to the formats listed in this paragraph are required \*.shp format file (shapefile) that will control and delimit the coastline, the bodies of water like oceans, rivers, lakes, roads, kind of vegetation etc.

# What the DFSbuilder does not

- Does not increase or decrease with precision terrain mesh resolutions. The resolution is achieved in external program. (Later in this tutorial there is a good example)
- Does not provide files XES, HGT or SHP to the user. Only indicates where to get them.
- Does not create airport areas flattens or any other area flatten on the scenery. Shows in a tutorial an option how to make.
- does not compile photo realistic scenarios.

# **Technical Requirements**

- Original copy of X-Plane 10 or 11
- Windows 7 or later version installed
- Computer with at least 8 GB of RAM and processor i5

# Knowledge of user requirements

- Know how to use the tools available for X-Plane SDK;
- Basic knowledge of creating files and directories in Windows;
- Know edit in Notepad;
- Assemble correctly the database where the DSFbuilder will read the HGT files, XES and SHP edited files.
- Understanding of digital terrain model and extracting the same data from websites download managers of satellite data.
- Know the organizational structure of the X-Plane and the priority of how they work.
- Know how Meshtool work.

# **Important notice**

The developer does not support questions of basic knowledge of Windows, knowledge of the Meshtool, X-Plane 11 or 10 Software Development Kit (SDK) and knowledge of satellite data acquisition required to build the mesh terrain. **If you do not fit within these knowledge requirements, we advise you not to buy the DSFbuilder**, or otherwise look before reading about these essential requirements of knowledge in website. If the user has no knowledge is required he visit the development of X-Plane to obtain knowledge essential. <u>https://developer.x-plane.com/.</u>

# Acquisition of DSFbuilder

You can buy the DSFBUILDER in two versions: home user(U\$ 27.00) and commercial user (U\$ 145.00), on the website <u>www.x-plane.com.br/dsfbuilder.</u>

Both versions have the same functions, differing only in the price and use.

After purchasing the user will receive a small file to run on the computer where is installed the DSFbuilder. This file will generate an installation code. It is necessary to send to the developer the alphanumeric information. The developer will return to the customer the executable customized for the user.

After receiving the DSFbuilder for download, do it and run by clicking on the icon with the letter M. It will open the following interface.

# Interface

Understanding the simple DSFbuilder interface



- 1) Is a resident of the DSFbuilder Directory (cannot be modified)
- 2) Number of files compiled by time (maximum 10). We recommend a maximum of 100 files in the Dataset each time to a PC with 8 MB RAM and processor i5. The more RAM and more powerful processor, more files can be allocated in the Dataset.

3) Generates DSF files

- 4) Resets the SAVED\_WORK folder where the user can copy the final files in the existing folders in Global Scenery of X-Plane 10 or 11.
- 5) Allow user to access the SCP.txt to be edited according to the needs of each project.
- 6) Option to use TIF format or HGT in the Dataset.
- 7) DSFbuilder message Field
- 8) Indicators of the quantity of the files used in the project. Both, XES and HGT formats, must to have the same amount before giving the command to generate.
- 9) Window where is seen the Meshtool compiling in real time.
- 10) Window showing which HGT or TIF files are being processed.
- 11) Window that shows the HGT files or TIF that contain errors. Fits the user have knowledge to fix them. (Later in this manual will be shown where to get necessary tools.)
- 12) Stop DSFbuilder process.
- 13) Quit DSFbuilder.

# Meshtool structure with DSFbuilder integrated.

Below in the first table the Meshtool original structure and in the second table initial integrated DSFbuilder structure after installation.

SDK X-Plane >	> Disco Local (C:) > DSFbuilder
Nome	MACOSX
.VS	config
MACOSX	HGT
config	tools
dsf	XES
tools	Osfbuilder.exe
Uninstall	HardwarelD.exe
HardwarelD.exe	lceland_sea.dbf
🚳 lua5.1.dll	📄 lceland_sea.prj
📧 MeshTool.exe	lceland_sea.shp
ali ObjView.exe	lceland_sea.shx
README.DDSTool	🗟 lua5.1.dll
README.meshtool	MeshTool.exe
README.ObjView	a ObjView.exe
README.XGrinder	README.DDSTool
README_FIRST	README.meshtool
temp1.xes	README.ObjView
temp2.xes	README.XGrinder
I XGrinder.exe	README_FIRST
	SCP.txt
	temp1.xes
	temp2.xes
	💽 XGrinder.exe

# **TUTORIAL 1**

# Automating tasks with DSFbuilder

### Step 1 - satellite data acquisition

Choose the Mesh scenery area to be built. It is very important that the user put a secure database free of errors at the source so that the process is not interrupted by DSFbuilder. If the file contains error (corrupted), the error message will appear in the appropriate field (10). He must be fixed and compiled separately to avoid recompile all files in dataset.

Download the database there can be done from several suppliers of DEM (Digital Elevation Model), in various formats. In this example we will use the more common, the HGT format, which can be downloaded for free at the link below. This SRTM formats provider \*.hgt offers medium resolution files, rarelly occurring incidence of errors in relief. This provider lets you download all files at once and already provides HGT format files for use in DSFbuilder. No conversion is necessary.

http://viewfinderpanoramas.org/Coverage%20map%20viewfinderpanoramas\_org3.htm



http://viewfinderpanoramas.org/dem3/ISL.zip

The **USGS LP DAAC**, supplier of files to generate the mesh, accessed at the URL <u>https://gdex.cr.usgs.gov/gdex/</u>, has the latest update ASTER DEM V2 Global, with reliefs in resolutions a lot better and with less errors to be corrected. It's a very interactive interface, easy to use, with the only drawback to free to download 20 tiles of 1 x 1 degree at a time. But, the user can do this as many times as you want until you get the files needed to complete the scenario. For now we will use data from the map above.

### **Mesh of Iceland**

Choose for this tutorial to build the Mesh of Iceland, which has 41 tiles HGT and 41 tiles XES. These tiles have inserted in DSFbuilder Setup, just as the Dataset example to build, <u>the user must remove these files before build your own mesh terrain</u>.

### This tutorial considers that downloaded the files from Viewfinderpanoramas

The first installation of the DSF builder already brings the tiles of the area of Iceland with the \*.hgt corrected, remembering that it is only the Mesh Terrain original without flattening areas and no correction (fine tuning) in the areas of airports.

Below the structure within the HGT directory in DSFbuilder.

Disco Local (C:) > DSFbuilder > HGT		
n63w017.hgt	n63w018.hgt	41 itens selecionados
n63w019.hgt	n63w020.hgt	
n63w021.hgt	n63w022.hgt	
n63w023.hgt	n64w014.hgt	
n64w015.hgt	n64w016.hgt	
n64w017.hgt	n64w018.hgt	
n64w019.hgt	n64w020.hgt	
n64w021.hgt	n64w022.hgt	Mostrar mais detalbes
n64w023.hgt	n64w024.hgt	Mostal mais detailes
n64w025.hgt	n65w014.hgt	
n65w015.hgt	n65w016.hgt	
n65w017.hgt	n65w018.hgt	
n65w019.hgt	n65w020.hgt	
n65w021.hgt	n65w022.hgt	
n65w023.hgt	n65w024.hgt	
n65w025.hgt	n66w015.hgt	
n66w016.hgt	📄 nббw017.hgt	
n66w018.hgt	n66w019.hgt	
n66w020.hgt	n66w021.hgt	
n66w022.hgt	n66w023.hgt	
пббw024.hgt		

Download files Land Class files concerning the coordinates of the HGT files. For files of Iceland have to download the XES folders.

+ 60-020.zip

+60-030.zip

This operation is free of charge from the website:

http://dev.x-plane.com/update/misc/MeshTool3/

### Step 2-data decompression and DataSet construction

Unpack them in the XES directory located in the root of the DSFbuilder. Attention to decompress and be careful not to create subfolders within the directory XES. For it is recommended to use the program WinRar (free, select the downloaded \*.xes file and in the Advanced menu choose option "Do not extract paths".

I I I I I I I I I I I I I I I I I I I	Ferramentas de Pasta Compactada Extrair	XES		- 0	~ (
Fixar no cesso rápido Área de Transferência	o Mover para • X Excluir •	Nova pasta Novo	Propriedades	Selecionar tu Elimpar seleci Inverter seleci Selecionar	ão
← → ~ ↑ 📕 > Este Computador > I	Disco Local (C:) > DSFBUILDER > XE	s	✓ ♂ Pesquisa	ar XES	Q
<ul> <li>Marcio N Amaral</li> <li>Este Computador</li> </ul>	rme +60+030.zip +60-020.zip		2 itens selecior	nados	
Área de Trabalho Documentos	Extraction path and option	s			, ;
Downloads	General Advanced				
Le Imagens					
Músicas	File time		Attributes		
Dietos 3D	Set modification time		Clear attribute "A	rchive"	
	Set creation time		Set file security		
Vídeos	Set last access time		Set attribute "Co	npressed	
Disco Local (C:)	File paths		Delete archive		
Arquivos de Programas	O Extract relative paths		Never		
📒 Arquivos de Programas (x8)	O Extract full paths		O Ask for confirmat	ion	
DSFBUILDER	Do not extract paths		Always		
.vs	O Extract absolute paths				
MACOSX	Miscellaneous				
config	Background extraction				
HGT	Wait if other WinRAR cop	ies are active			
tools	Allow absolute paths in sy				
	Allow potentially incompa	tble names			
Uninstall					
XES					
2 itens 2 itens selecionados 34.1 MB					

The XES folder in DSFbuilder root.

> Disco Local (C:) > DSFbuilder > XES	
+63-017.xes	+63-018.xes
+63-019.xes	
+64-019.xes	+64-020.xes
+64-021.xes	+64-022.xes
+64-023.xes	+64-024.xes
+64-025.xes	+65-014.xes
+65-015.xes	+65-016.xes
+65-017.xes	+65-018.xes
+65-019.xes	+65-020.xes
+65-021.xes	+65-022.xes
+65-023.xes	+65-024.xes
+65-025.xes	+66-015.xes
+66-016.xes	+66-017.xes
+66-018.xes	+66-019.xes
+66-020.xes	+66-021.xes
+66-022.xes	+66-023.xes
+66-024.xes	

Gathered their \*.hgt and \*.xes files, copy them to their respective folders HGT and XES in DSFbuilder root.

Remembering the parity of the files, 41 in the format \*.hgt and 41 in the format \*.xes

### Step 3-using the DSFbuilder

Open the **DSFbuilder.exe** program by clicking on the desktop shortcut.

Check by the Quantity indication if the files are same me number, both \*. XES and \*. HGT. Must to have equal numbers and be relative about coordinates. Otherwise the DSFbuilder not work.

Edit the SCP.txt necessary for definition of the script for the Meshtool run. If the user has difficulty editing Scripts, access the online manual at <a href="https://developer.x-plane.com/manuals/meshtool/">https://developer.x-plane.com/manuals/meshtool/</a>.

Click the Edit button on the interface Script to populate the parameters that your scenario requires and save.

Defbuilder Configuration Working Directory C-OSFBUILDER Number of fles at a time 10 Generate DSF	Reset SAVED WORK	Edit Script SPC.TXT		
File Type HGT V				
Reading:	Quantity Quantity	HGT: Arquiv	P.txt - Bloco de notas vo Editar Formatar Exibir Ajuda GROUND ternain_Natunal	
Meditool in execution	Processing 1x1 DSF tiles Bad files see HGT log and XES	SHAPE	_SPECS 312000 6.5 EFILE_TERRAIN terrain_Water Ice:	land_sea.shp
Stop	C	Duit		

Choose which interface digital terrain model format that is in use, \*.hgt or \*.tif

### Generate the DSF files

After clicking the Generate DSF command, DFSbuilder will automatically create the following folders below the DSFbuilder.exe and HardwareID.exe executable files in the root. DSFbuilder will also generate all DSF files at their roots while copying the valids to the SAVED\_WORK folder. In the next Generate DSF command, all dsf files in the root will be automatically redefined. In order for the DFSbuilder to be validated, the user must first execute HardwareID.exe, which will generate code that must be sent to the developer to generate a license.



### DSF

Original of the Meshtool in archiving border.txt required. DSFbuilder will generate it when started for the first time.

### **GLOBAL SCENERY**

Folder containing the original structure of the X-Plane 10 and 11 with the \*.dsf files in their respective folders. This folder will be reset whenever the user starts a new job.

### HGT

Folder where the user will keep your \*.hgt or \*.tif files

### SAVED\_WORK

Folder where will be written the same files from the DSFbuilder\Global Scenery that will be reset on DSFbuilder interface to the user command. She will keep all the work generated by the user, so accumulated in the structure of the X-Plane X-Plane 10 and 11. This folder will never be reset automatically.

### BAD\_HGT\_XES

Folder where the HGT corrupted files will be copied

### XES

Folder where will be held the files \*.xes

After the end of the process the DSFbuilder shows which HGT files have errors at the source and that need to be fixed using specific programs for correctness and submitted individually to the new generation process. We recommend the GlobalMapper, which is commercial, however there are other free programs that can be downloaded from the Internet.

Below the interface after compilation showing two \*.hgt files with errors. These will not be raised their respective \*. dfs.

🕘 Dsfbuilder		-	- 🗆 X
Configuration			
Working Directory			
C:\DSFBUILDER\			
Number of files at a time			
10			
Generate DSF			EditScript
File Type		Reset SAVED WORK	SPC.TXT
HGT			
nai	~		
Reading: 39 files of 41 done.		Quar	ntity XES: 41
Done!		Quar	ntity HGT: 41
Done!			
Meshtool in execution		Processing 1x1 DSF tiles	
267616	^	BUILDING MESH: +65-014.x	es not converted
Objects: 0, Polys: 0 Objects: 0, Polys: 0		BUILDING MESH: +66-024.x	es not converted
next pool would be at 379		Dolebing Mean. 100 024.	conveneu
3-d Objs pool starts at: 0			
LU: 64, Objdef: 0, PolyDef: 0			
LU: 19, Objdef: 0, PolyDef: 0 Total cross-pool primitives: 6659. Total range			
primitives: 2845. Total enumerated primitives: 408.			
Terrain pool depth 5 starts at 0			
Chains: 0, Shapes: 0		1	
Chains: 0, Shapes: 0 Done		Bad files see HGT.log and X	ESlog
Terrain pool depth 7 starts at 221			-
Objects: 0, Polys: 0		data at the point 1200,1200. have no gaps or missing data	
Poly pool depth 3 starts at 612		014.xes HGT n64w025.hgt	: ALS. 405
LU: 26, Objdef: 0, PolyDef: 0			
next pool would be at 650 Chains: 0, Shapes: 0		BUILDING MESH: (scp.txt: lin	ne 0.) XES: +65-
Total cross-pool primitives: 31680. Total range		014.xes HGT n64w025.hgt	
primitives: 13605. Total enumerated primitives: 2181.		BUILDING MESH: Could not	read HGT file:
Done		hgt\N66W024.hgt XES: +66-	
Objects: 0, Polys: 0 LU: 68, Objdef: 0, PolyDef: 0		n66w023.hgt	
Chains: 0, Shapes: 0			
	~		~
Stop			Quit
Stop			Quit

Occurring that, after having fixed the HGT files, or downloaded other different source and that are healthy, the user has the option to perform all build again, or to save time delete all the files contained in the directories XES and HGT and copy for them only those who need to be recompiled. To restart the process, the DSFbuilder will do a reset in all its proprietary aggregate folders to the root of the Meshtool, except the SAVED\_WORK folder that stores a backup of all valid \*.dsf files ready to be copied to the X-Plane 10 or 11;

The DSFbuilder generates files for the X-Plane 10 and 11 at the same time. Below the SAVED\_WORK folder after the end of the generated process.

SAVED_WORK	X Diana 11 Dama Anaga
X-Plane 10 Global Scenery	-X-Plane 11 Demo Areas
Earth Nav Data	Earth Nav Data
+60-020	+60-020
+63-017.dsf	+63-017.dsf
+63-018.dsf	+63-018.dsf
+63-019.dsf	+63-019.dsf
+63-020.dsf	+63-020.dsf
+64-014.dsf	+64-014.dsf
+64-015.dsf	+64-015.dsf
+64-016.dsf	+64-016.dsf
+64-017.dsf	+64-017.dsf
+64-018.dsf	+64-018.dsf
+64-019.dsf	+64-019.dsf
+64-020.dsf	+64-020.dsf
+65-015.dsf	+65-015.dsf
+65-016.dsf	+65-016.dsf
+65-017.dsf	+65-017.dsf
+65-018.dsf	+65-018.dsf
+65-019.dsf	+65-019.dsf
+65-020.dsf	+65-020.dsf
+66-015.dsf	+66-015.dsf
+66-016.dsf	+66-016.dsf
+66-017.dsf	+66-017.dsf
+66-018.dsf	+66-018.dsf
+66-019.dsf	+66-019.dsf
+66-020.dsf	+66-020.dsf
100 0201031	
+60-030	+60-030
+63-021.dsf	+63-021.dsf
+63-022.dsf	+63-022.dsf
+63-023.dsf	+63-023.dsf
+64-021.dsf	+64-021.dsf
+64-022.dsf	+64-022.dsf
+64-023.dsf	+64-023.dsf
+64-024.dsf	+64-024.dsf
+64-025.dsf	+64-025.dsf
+65-021.dsf	+65-021.dsf
+65-022.dsf	+65-022.dsf
+65-023.dsf	+65-023.dsf
+65-023.031 +65-024.dsf	+65-024.dsf
+65-025.dsf	+65-025.dsf
+65-025.05+ +66-021.dsf	+66-021.dsf
+66-021.ds+	+66-022.dsf
	+66-023.dsf
+66-023.dsf	

### DSFbuilder manual ends here.

Attention: We recommend that user not use any programs while DSFbuilder is running. Unless the user instructs DSFbuilder to run fewer files simultaneously or if has a PC configured with high processing power.

The next section, **RETRIEVING HGT FILES**, shows one of the ways to fix HGT files and the way to fix the terrain elevations, in addition to the flattening of the relief areas at airports. After your work, copy the compiled the directories contained in the directory SAVED\_WORK to X-Plan

# **RETRIEVING HGT FILES**

One of the more complex tasks in the construction of airports that need detailing and flattening of the relief in the areas of airports is the handling of the mesh, primarily by the fact that the satellite readings always present discrepancies and errors in the surfaces. The option in the WED editor solves part of the problem, however it creates a very flattened area and differs a lot from reality. In regions near rivers, lakes and oceans, especially near the banks, this option in the WED causes discrepancies in the relief that advances on the aquatic masses forming undesirable steps of water.

### **Requirements for correction of a DEM, HGT or TIF**

- Files with errors or need detailing and flattening in areas specified by the user.
- Program satellite data handling. There are several free, but not as efficient as a commercial application as the Global Mapper. The user can download it for free to try out the results by following this step by step.

## **Correcting flaws in HGT files (filling gaps)**

When the user uses the meshtool compiling manually on the command line and at the end of the process shows the error message saying that the HGT or any other DEM compatible errors there will be porting the need to fix them. Such errors are referred to as "gaps", which are presented in the original construction flaws in the file. For better understanding, below we will fix an error file. Were inserted in the folder \*.hgt files to be 41 HGT compiled at once, however the DSFbuilder shown in the window of mistakes two of them that not compiled. The DSFbuilder compiled 39 of 41 discarding the twos containing flaws and showing in windows error.

N64W025.hgt and N66W024.hgt (the files \*. XES must be ignored) At the root of the DSFbuilder HGT.log file is generated listing such errors or annotate the shown in appropriate DSFbuilder window.

Processing 1x1 DSF tiles BUILDING MESH: +65-014 xes not converted	4
BUILDING MESH: +66-024 xes not converted	Ы
, Bad files see HGT.log and XES.log	
data at the point 1200,1200. Meshes must have no gaps or missing data! XES: +65- 014.xes HGT n64w025.hgt	^
BUILDING MESH: (scp.txt: line 0.) XES: +65- 014.xes HGT n64w025.hgt	
BUILDING MESH: Could not read HGT file: hgt\N66W024.hgt XES: +66-024.xes HGT n66w023.hgt	
	¥

Global Mapper is the tool we will used to correct the error files. The Global Mapper allows you to use for free for a certain period in trial version.

Open the \*.hgt file with error in Global Mapper. Apparently doesn't show any errors, however, if we examine with some detail, applying zoom in, on the far right above there will be a small overlap failure,

a gap that needs to be filled. The error usually occurs in areas of the corners and that contains mainly surfaces with water masses.

Below the file N65W014.hgt and right one in detail.



### Approaching the GlobalMapper



Use the authoring tool to the area by dragging the mouse to cover the area of the fault with a rectangle.



When you drag the mouse and create the rectangle with any name and specify the preset LAND AREA, click OK. On the Global Mapper will arise the filled rectangle with the specified name.



Choose the pencil tool for editing the altitude. Is necessary to transform this rectangle polygon in Mesh.

Choosing the menu and clicking on the pencil he's going to show selected polygon. Dragging the mouse over it with the left button pressed, select the four corners of the polygon. Following click with the right mouse button on the center of the polygon.



Dialog box will appear and choose EDIT AREA FEATURE



Going to pop up the dialog. Click on Line Vertices, select all points and click on ADD ELEVATION and set ALTITUDE 0 (zero) in the field, and click OK. The rectangle will be ready to be transformed for polygon mesh.

	y name error				Vertices				
Feature Typ									
Land Area			~	Create N	lew Type				
Feature Lay	ver (Right Click for N	fore Options)		실 Fea	ture Vertex List				
<user crea<="" td=""><td>ated Features&gt;</td><td></td><td></td><td>Vertex</td><td>.ist (Double-Click to (</td><td>Center View on Vertex</td><td>, Right-Click</td><td>for More Optio</td><td>ns)</td></user>	ated Features>			Vertex	.ist (Double-Click to (	Center View on Vertex	, Right-Click	for More Optio	ns)
Feature De:	scription			ldx	Longitude	Latitude	Length	Total Length	
Use Cu:	stom Description:	Land Area		1	13° 00' 06.1997'' W	66° 00' 04.2660" N	143.12 m		8
					12° 59' 54.8514'' W	66° 00' 04.2660" N	305.56 m	143.12 m	
Feature Sty	le				12° 59' 54.8514'' W	65° 59' 54,4011'' N	143.14 m	448.68 m	
🖲 Use Del	fault Style for Select	ted Feature Type			13° 00' 06.1997'' W	65° 59' 54,4011'' N	305.56 m	591.82 m	
O Specify	Style to Use When	Bendering Feature		5	13° 00' 06.1997'' W	66° 00' 04.2660" N		897.38 m	
Lu	stomize Style								
Feature Attr	ibutes			<					3
	Attribute Name		Attribu	Edit	Position Ad	d Elevs Edit L	.ength	Copy to Clipb	bar
			897		Delete Selected V	ertices Update Fle	vations from	Terrain	
	PERIMETER					opdate Lie	vauoris non	renain	
	PERIMETER NCLOSED_AREA	C	0.0433						
		(				OK Car	icel		
	NCLOSED_AREA	C Delete Add File	0.0433 no=			OK Car	ncel		
El	NCLOSED_AREA		0.0433 no=			OK Car	icel		
El Add	NCLOSED_AREA		0.0433 no=			OK Car	ncel		
El Add Add/Edit	NCLOSED_AREA	Delete Add File	0.0433 205 Link(s,	·		OK Car	ncel		
El Add Add/Edi	NCLOSED_AREA	Delete Add File	0.0433 205 Link(s,	Node: U	nspecified ~	OK Car	ncel	_	
El Add Add/Edil Altitude Moc	NCLOSED_AREA	Delete Add File	D.0433		nspecified ~	OK Car	icel		
Add Add/Edil Altitude Moo	NCLOSED_AREA	Delete Add File	D.0433			OK Car	icel		

Click again with the mouse in the polygon, always with the PENCIL tool, and then choose the options shown below. ADVANCED FEATURE CREATION OPTIONS and window open in TERRAIN-CREATE FLATTEN TERRAIN FROM SELECTED AREA FEATURES.

		EDIT - Edit Area Feature			
	+	Move Area Feature (Ctrl+Shift+M)	Ctrl+Shift+M		
<b>-</b>		Delete Area Feature			
	`@ <sup>+</sup>	Insert Vertex			
	×	CLEAR - Clear Current Selection			
		Create Area/Polygon Features	Þ		
		Create Line Features	Þ		
		Create Point/Text Features	۱.		
		Advanced Feature Creation Options	•	1	BUFFER - Create Buffers Around Selected Feature(s)
		Move/Reshape Feature(s)	۱.		TERRAIN - Create/Flatten Terrain from Selected Area Feature(s)
		Vertex Editing	Þ	£	GRID - Create Regular Grid of User-Specified Size/Orientation
		Attribute/Style Functions	+		Create New Points at Centroids of Selected Area Feature(s)
		Crop/Combine/Split Functions	•		Create Randomly Distributed Points within Selected Area Feature(s)
		Advanced Selection Options	•		Create Point Features Spaced Along Selected Feature(s)
		Analysis/Measurement	Þ	ંં	Create New Points from Selected Area and Line Features
		Options	►	2	Create Line Feature(s) from Selected Area Feature(s)
					Create Area Skeletons/Center Lines
					Subdivide Quadrilateral Area
					Create Coverage Area (Concave Hull) for Selected/Loaded Features
					Create Perpendicular Lines Spaced Along Selected Line/Area Feature(s)

Will appear a dialog box with the specifications. For altitude 0 (zero), leave the options X-axis and yaxis to 0 (zero). In the case of applying the same rule in polygons with more points in areas of airports that need to be flattened, the X-axis and y-axis should be with the option Manually in both 0.00001 fields for the Global Mapper create a mesh of very high resolution in HGT and may be up to centimeters.

But, in this case to just fill the error, leave the default (AUTOMATICALLY) and click on OK.

Elevation Grid Creation Options	
 Grid Options Tiling Grid Bounds	
Description Any name error (Elevation Grid)	
Vertical Units METERS	~
Grid Spacing	
Automatically Determine Optimal Grid Spacing	
Manually Specify the Grid Spacing to Use	
X-axis: 0 arc degrees	
Y-axis: 0 arc degrees	
If you wish to change the ground units that the resolutio specified in, you need to change the current projection Projection tab of the Configuration dialog.	
Elevation Grid "No Data" Distance Criteria	
This setting controls how far from a known data point the elevation grid cell has to be before it is considered invali default setting assumes all grid points are valid. Lower va make the valid grid stay tighter around known data point	d. The alues
Tight	Loose
Use 3D Area/Line Features as Breaklines (Hard Edge	)
Flatten 3D Area Features     Taper 3D Area Features Using Curve Value:	_
Ignore Zero Elevations	
Save Triangulation Network (TIN) as a Vector Layer	
Heights Relative to Ground (Using Loaded Grid Layers Fill Entire Bounding Box Instead of Just Inside Convex	1 C
The critic bounding box instead of Just inside convex	T ICH

Deleting the polygon that is no longer needed the result is the error in the HGT as shown in figure below.

Global Mapper v19.1 (b021218) [64	l-bit]- *** UNREGISTI	ERED ***								
File Edit View Tools Analysi	s Layer Search	GPS Help								
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The next step is to export by choosing EXPORT ELEVATION GRID FORMAT

1	Open All Files in a Directory Tree	Export 3D Format
R	Open Data File at Fixed Screen Location	Export Elevation Grid Format
	Unload All Ctrl+U	Export Raster/Image Format
	Download Online Imagery/Topo/Terrain Maps	Export Vector/Lidar Format
		Export Web Format
	Create New Map Catalog	Export Elevation Spatial Database
	Rectify (Georeference) Imagery	Export Raster/Image Spatial Database
	Load Workspace Ctrl+W	Export Vector Spatial Database
E	Save Workspace Ctrl+S	
	Save Workspace As Ctrl+Shift+S	Export 3D Format To Cloud
	Run Script	Export Elevation To Cloud
		Export Raster/Image To Cloud
	Capture Screen Contents to Image Shift+C	Export Vector/Lidar To Cloud
	Export	Export Global Mapper Package To Cloud
	Batch Convert/Reproject	

Choose the type of file you want to export, in the case of HGT format, choose SRTM1 or STRM3

Select Export Format	×
Select the format to export your loaded data to. See http://www.bluematblegeo.com/products/global-mapper-formats.php for information on the available formats.	
SRTM1 (1 arc second · HGT)	~
JPG2000 Elevation Grid	^
Leveller Heightfield Lidar LAS File	
Lidar LAZ (LASzip) File	
MapMaker Terrain File	
NGS Geoid ASCII Grid NITF Elevation File	
Optimi Terrain Grid	
PDF (3D)	
PGM Grayscale Grid PLS-CADD XYZ File	
RAW	
RockWorks Grid	
SRTM1 (1 arc second - HGT) SRTM3 (3 arc second - HGT)	-
STL (ASCII Text or Binary) File (Elevation Data Only)	
Surfer Grid (ASCII Format)	
Surfer Grid (Binary v6 Format) Surfer Grid (Binary v7 Format)	
Terragen Terrain File	
U3D T	
UCD (ASCII)	
Unity RAW Terrain/Texture USGS DEM	
Vertical Mapper Grid File	
VRML	
Vulcan3D Triangulation File WindSim GWS Roughness/Elevation File	
XYZ Grid	
Zmap Plus Grid File	~
5	

The program will generate a new file N64W025.hgt without error.

Done this procedure in the archives with error, submit them to DSFbuilder to generate the + 65-014.dsf on the N65W014.hgt, which will be aggregated with the correct files into the SAVED\_work folder.

# FLATTENING THE TERRAIN WITH THE GLOBAL MAPPER

It is common when you see the X-Plane many discrepancies, mostly along some leads that makes it impossible to perform takeoffs and landings. To solve you need to adjust the altitude of the area of the airport. Let's use as an example a critical area is the SBRJ Santos Dumont Airport in Rio de Janeiro, where geography shows severe altitude errors in DEM files.

A good source of files with better resolution has already been cited at the beginning of this document. Visit the link <u>https://gdex.cr.usgs.gov/gdex/</u>, do your register to be able to download for free a series of satellite data with good resolution. Enclose the area and find the Tile that you want. In the case of Rio de Janeiro is S23W044, that after downloading the site mentioned above comes in **ASTGTM2\_S23W044\_dem.tif** format, which must be loaded into Global Mapper. You can download only one or the amount of tile 1 x 1 desired.







Choose the CREATE tool AREA FEATURE for irregular polygons.



Enclose the desired area, and may contain multiple vertices with any amount of points, noting that the higher resolution greater processing capacity must be your PC. After closing the polygon dialog box appears. Select all bertices in the polygon, click the button ADD and in the dialog box, select 8 meters above sea level, which is the surface you want to glide.



Following with the left mouse button pressed drag diagonally and select all vertices.

Click with the right mouse button on the selected polygon with the all selected vertices.



Click EDIT AREA FEATURE and the dialog box below. Click VERTICES, the second dialog box, select all the lines of the vertexes and click EDIT ELAVATION, appearing the third dialog box. If you don't show up the first time, try EDIT ELEVATION again until she arise (bug of the program Global Mapper) following will pop up box with the height of 8 meters, and then click OK.

	Modify Feature Info Name Flatten, tbij Vetices	
	Feature Type Land Area Cleate New Type Feature Layer (Right Click for More Options) (User Created Features)	
Feature Vertex List     Vertex List     Vertex List (Double-Click to Center View on Vertex, Right-4	Feature Description Use Custom Description Use Custom Description Type Type Click for More Options) Feature Sample Label	
Idx         Longitude         Latitude         Len           28         43°09'57.5553°W         22°54'52.7163°S         276.7           28         43°10'65.0867W         22°54'33.9174°S         381.6           31         43°10'165.117430°W         22°54'05.91647°S         381.6           31         43°10'163.07W         22°54'05.4174°S         22.61           33         43°10'12.25557W         22°54'161.7459°S         256.0           34         43°10'12.2552°W         22°54'18.7459°S         365.0	'3 m         4.896 km         36'' 16''55.7''         :           '37 m         5.118 km         316'' 15' 50.9''         :         Attribute Value         ^           '66 m         5.55 km         11'' 37' 583''         :         6.279 km         .           '12 m         5.694 km         320'' 10'' 45.7''         :         1.651 set km         .	
Delete Selected Vertices Update B	Copy to Cipboard     Elevation Terrain     Carcel     Edd Fly-Through Path     Automatically apply these retings to new fe	× se for the selected vertices.
		Cancel

Then click with right mouse button on the image and choose the options below and click on the two options below to create open the flatten resolution setting.



The dialog box where you increase the spacing of points to define the resolution of the Mesh. The Default is 0.0 select the manual option. In the table below the polygon to generate the area flatten received a mesh of points with the resolution of X = 0.000001 X Y = 0.000001. Press OK to generate the DEM Flatten.

Elevation Grid Creation Options         Grid Options         Tiling       Grid Bounds         Description       Raten_sBRJ (Triangulated Elevation Grid)         Vertical Units       METERS         Grid Spacing       Automatically Determine Optimal Grid Spacing         Automatically Determine Optimal Grid Spacing       Automatically Determine Optimal Grid Spacing         Vertical Units       METERS         Up with to Change the ground units that the resolution is specified in you need to change the current projection not the Projection tab of the Corriguration dialog.         Bevation Grid TNo Data" Datance Critera         This setting controls how far from a known data point that an effecting assumes all grid points are valid. Lower values make the valid grid data tighter around known data points.         Tight       Loose         Value Taper 3D Area Features Using Curve Value:       Tight         Use 3D Line Features as Constraints (i.e. Breaklines)       Fillerinis Relative to Ground (Using Loaded Grid Layers)         Fill Entire Bounding Box Instead of Just Inside Convex Hull       Fill Entire Bounding Box Instead of Just Inside Convex Hull		Elevation Grid Creation Options
Vertical Units       METERS         Cirid Spacing		Grid Options   Tiling   Grid Bounds
Vertical Units       METERS         Grid Spacing       CAtomatically Determine Optimal Grid Spacing         C Manually Specify the Grid Spacing to Use       X-axis:         X-axis:       0.000001       arc degrees         Y-axis:       0.000001       arc degrees         Tight       Locoee       Use 3D Line Features Sconstraints (i.e. Breaklines)         V= Fatter 3D Area Features	900 B	Description Flatten_sBRJ (Triangulated Elevation Grid)
<ul> <li>C Automatically Determine Optimal Grid Spacing</li> <li>Manually Specify the Grid Spacing to Use</li> <li>X-axis: 0.00001 arc degrees</li> <li>Y-axis: 0.00001 arc degrees</li> <li>Y-axis: 0.00001 arc degrees</li> <li>F you need to change the crurent projection on the Projection tab of the Configuration dialog.</li> <li>Bevation Grid "No Data" Distance Criteria</li> <li>This setting controls how far from a known data points that are elevation grid etta y tighter around known data points.</li> <li>Bevation Grid "No Data" Distance Criteria</li> <li>Tight Loose</li> <li>Tight Loose</li> <li>Gave Tainagulation Network (Till) as a Vector Layer</li> <li>Heights Relative to Ground (Using Loaded Grid Layers)</li> </ul>		Vertical Units METERS
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		Use 3D Line Features as Constraints (i.e. Breaklines) Flatten 3D Area Features Taper 3D Area Features Using Curve Value: [gnore Zero Bevations Save Triangulation Network (TIN) as a Vector Layer
OK Cancel Apply Help		Use 3D Line Features as Constraints (i.e. Breaklines) Ratten 3D Area Features Taper 3D Area Features Save Triangulation Network (TIN) as a Vector Layer Heights Relative to Ground (Jung Loaded Grid Layen) Fill Entire Bounding Box Instead of Just Inside Convex Hull

Delete the polygon area and flatten the user created on the file \*.hgt. Following, export the GRID elevation SRTM 1 or 3 and this is the result of the figure below. A completely flat surface with very high resolution of the mesh, 1 meter or centimeters if necessary.



After download all data from the Global Mapper and upload your new tile S23W044.hgt created, that will show in the result the area flatten.



Below, detail of the \*.hgt file before and after the Flatten.



The next step is to copy the new S23W044.hgt to the folder DSFbuilder, check the HGT the corresponding LANDCLASS your -23-044.xes is inside the folder XES, also at the root of DSFbuilder. Following press GENERATE DSF in DSFbuilder. A new file -23-044.dsf in the folder SAVED\_WORK.

Copy to the X-Plane and test. It is the responsibility of the user to observe the result in practice, performing procedures for takeoff and landing. It is common to achieve flatten adjustment several times until we get the desired result. Be patient.

### Free GIS programs

Tested and use only the Global Mapper. It is the responsibility of the user to search on the free alternatives

https://alternativeto.net/software/global-mapper/?license=free

### Free Data Satellite

https://www2.jpl.nasa.gov/srtm/

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