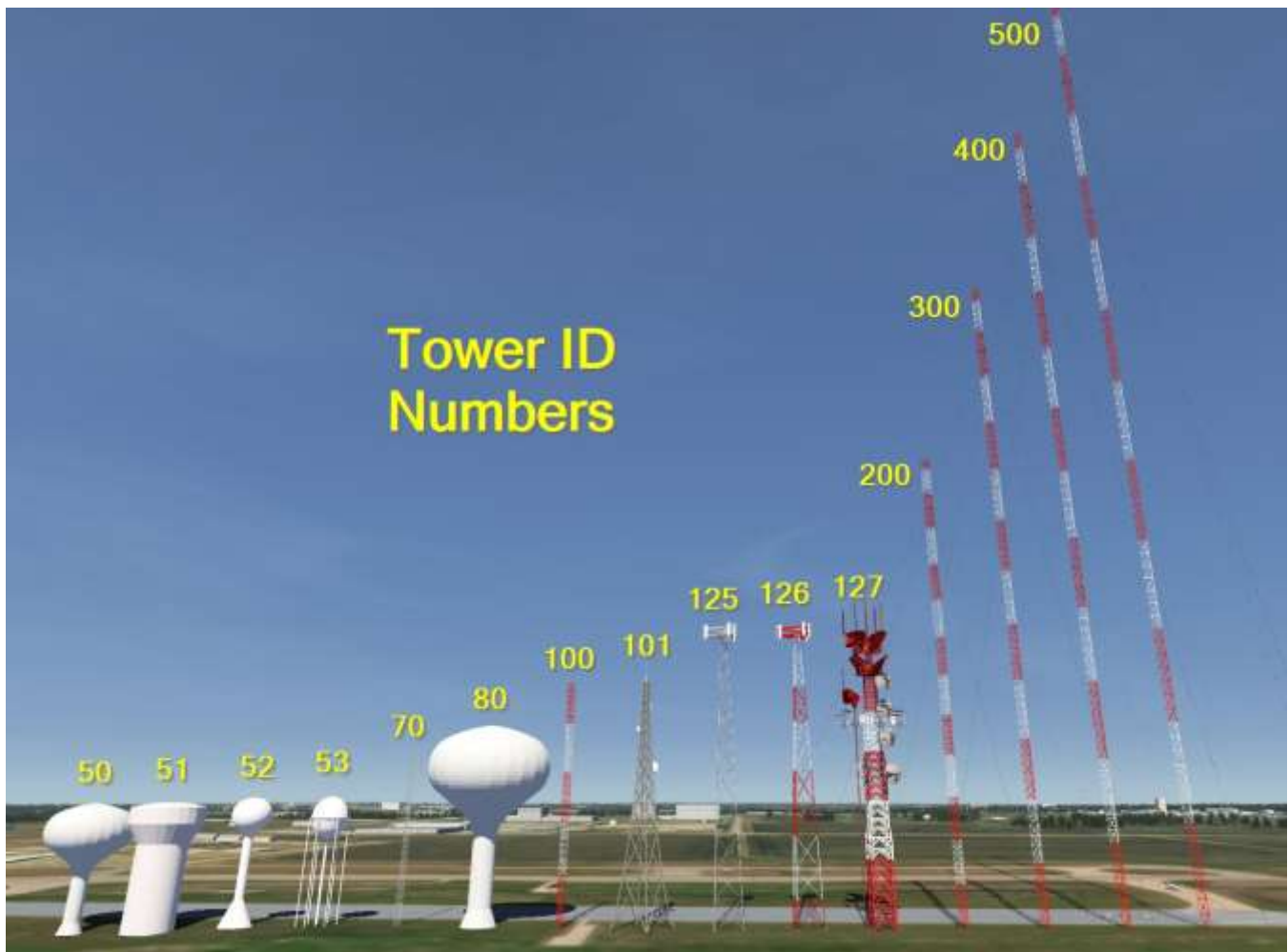


Adding Lighted Towers How-To (kenventions 12/12/18)

After manually creating the South Florida TL add-on, I decided to automate the tsc file & toc file generation to make it easier for others to add lighted radio towers and lighted water towers to their own scenery projects.

The basic process requires you to use Google Maps to copy the lat/lon coordinates for each tower location and paste them into an Excel file. You then run the **FS2towerProc.exe** program to auto-generate the tsc & toc files - that's it!

The Towers Library includes the following 15 towers - thanks Jake (ZoSoChile)!



Process Overview

- 1) unzip the file into your `\Documents\Aerofly FS 2\scenery\places\US` folder (or another regional folder)
 - 2) use vfrmap.com & Google Maps to locate the towers to add to FS2, then update the included Excel file
 - 3) run the `FS2towerProc.exe` program to auto-update the included tsc & toc files with your new towers
- ... then go for a test flight!

Step 1) Details

The zip file includes an example Excel file that displays all 15 towers just west of the Denver airport. After you unzip the towerProcTL.zip file to your `\Documents\Aerofly FS 2\scenery\places\US` folder, rename the `towerProcTL` folder to `DenverTL`. You can take a test flight now if you want to check out the towers.

When you are ready to add towers to your own scenery project, unzip the file again and rename the new `towerProcTL` folder to something like `citynameTL`. For additional tower projects, repeat the process (unzip again and rename the new folder). Each tower project will have its own folder just like FSCP airports have individual folders.

Step 2) Details

Use vfrmap.com to locate radio towers and their heights. In the example below, there are multiple tall towers northwest of the Denver airport. These towers are near the town of Dacono and are ~1260 feet tall (~400m).



Before checking Google Maps, notice the location and curves of the nearby roads (red arrow).

From Google Maps, locate the same curved road, then zoom in looking for antenna shadows.



If the ground is cluttered with other objects, try the Google Maps 3D mode to help locate the towers above the other objects / buildings. Towers don't always show up as 3D objects in 3D mode.

Click on the base of the first tower to identify its lat/lon coordinates then copy the lat/lon link ...



- Open the **tower_list.xlsx** file
- If this is a new project, delete the existing tower info in columns A, B, C, and D (leave columns E & F)
- Paste the lat/lon info into the next available row
- Add a tower description in the “Tower Label” column
- Repeat for any other nearby towers

	A	B	C	D	E	F	G
1	Tower Label	ID#	Flash	Google Maps Lat,Lon	lat	lon	
2	Water-Medium	50	2.0	39.859825,-104.719633	39.859825	-104.719633	
3	Water-Medium Column	51	2.1	39.865437,-104.712921	39.865437	-104.712921	
4	Water-Small Tee	52	2.2	39.861730,-104.709611	39.861730	-104.709611	
5	Water-Small Legs	53	2.2	39.859951,-104.709682	39.859951	-104.709682	
6	Radio-Gray 70m	70	2.0	39.857631,-104.729518	39.857631	-104.729518	
7	Water-Large	80	2.1	39.856923,-104.732360	39.856923	-104.732360	
8	Radio-R/W 100m	100	2.0	39.858885,-104.729480	39.858885	-104.729480	
9	Radio-Gray 100m	101	2.0	39.860089,-104.729486	39.860089	-104.729486	
10	Cell-Gray 125m	115	2.2	39.854866,-104.731939	39.854866	-104.731939	
11	Cell-R/W 125m	126	2.2	39.854866,-104.732528	39.854866	-104.732528	
12	Radio-R/W 125m	127	2.3	39.852814,-104.728244	39.852814	-104.728244	
13	Radio-R/W 200m	200	2.3	39.852770,-104.726259	39.852770	-104.726259	
14	Radio-R/W 300m	300	2.3	39.852769,-104.724248	39.852769	-104.724248	
15	Radio-R/W 400m	400	2.3	39.852767,-104.722095	39.852767	-104.722095	
16	Radio-R/W 500m	500	2.3	39.852767,-104.720114	39.852767	-104.720114	
17	Dacono-North			40.099182,-104.900929	40.099182	-104.900929	
18	Dacono-South			40.096486,-104.901673	40.096486	-104.901673	
19					none	none	
20					none	none	
21					none	none	

The ID# column is used to identify which tower 3D object to display in FS2.

- Look at the Tower Library photo and enter the appropriate ID# for each tower

In this example, the vfrmap site shows these towers as ~1260 feet or ~400 meters and the shadows are similar so “400” should be entered in the ID# column ...

	A	B	C	D	E	F	G
1	Tower Label	ID#	Flash	Google Maps Lat,Lon	lat	lon	
2	Water-Medium	50	2.0	39.859825,-104.719633	39.859825	-104.719633	
3	Water-Medium Column	51	2.1	39.865437,-104.712921	39.865437	-104.712921	
4	Water-Small Tee	52	2.2	39.861730,-104.709611	39.861730	-104.709611	
5	Water-Small Legs	53	2.2	39.859951,-104.709682	39.859951	-104.709682	
6	Radio-Gray 70m	70	2.0	39.857631,-104.729518	39.857631	-104.729518	
7	Water-Large	80	2.1	39.856923,-104.732360	39.856923	-104.732360	
8	Radio-R/W 100m	100	2.0	39.858885,-104.729480	39.858885	-104.729480	
9	Radio-Gray 100m	101	2.0	39.860089,-104.729486	39.860089	-104.729486	
10	Cell-Gray 125m	125	2.2	39.854866,-104.731939	39.854866	-104.731939	
11	Cell-R/W 125m	126	2.2	39.854866,-104.732528	39.854866	-104.732528	
12	Radio-R/W 125m	127	2.3	39.852814,-104.728244	39.852814	-104.728244	
13	Radio-R/W 200m	200	2.3	39.852770,-104.726259	39.852770	-104.726259	
14	Radio-R/W 300m	300	2.3	39.852769,-104.724248	39.852769	-104.724248	
15	Radio-R/W 400m	400	2.3	39.852767,-104.722095	39.852767	-104.722095	
16	Radio-R/W 500m	500	2.3	39.852767,-104.720114	39.852767	-104.720114	
17	Dacono-North	400		40.099182,-104.900929	40.099182	-104.900929	
18	Dacono-South	400		40.096486,-104.901673	40.096486	-104.901673	
19					none	none	
20					none	none	

The last column to fill-in is “Flash”.

Obstruction lights are generally required to flash 30 times per minute or once every 2 seconds so 2.0 would be the typical value entered in the “Flash” column.

However, using 2.0 for every tower would make them all flash at the same time so adjusting the “Flash” value slightly for some towers will create a more realistic look. The FAA does require that close towers flash in sync so always assign those towers the same “Flash” value to maintain that realism.

In this example, both towers are close to each other, so they will be assigned the same “Flash” value of 2.0 ...

	A	B	C	D	E	F	G
1	Tower Label	ID#	Flash	Google Maps Lat,Lon	lat	lon	
2	Water-Medium	50	2.0	39.859825,-104.719633	39.859825	-104.719633	
3	Water-Medium Column	51	2.1	39.865437,-104.712921	39.865437	-104.712921	
4	Water-Small Tee	52	2.2	39.861730,-104.709611	39.861730	-104.709611	
5	Water-Small Legs	53	2.2	39.859951,-104.709682	39.859951	-104.709682	
6	Radio-Gray 70m	70	2.0	39.857631,-104.729518	39.857631	-104.729518	
7	Water-Large	80	2.1	39.856923,-104.732360	39.856923	-104.732360	
8	Radio-R/W 100m	100	2.0	39.858885,-104.729480	39.858885	-104.729480	
9	Radio-Gray 100m	101	2.0	39.860089,-104.729486	39.860089	-104.729486	
10	Cell-Gray 125m	125	2.2	39.854866,-104.731939	39.854866	-104.731939	
11	Cell-R/W 125m	126	2.2	39.854866,-104.732528	39.854866	-104.732528	
12	Radio-R/W 125m	127	2.3	39.852814,-104.728244	39.852814	-104.728244	
13	Radio-R/W 200m	200	2.3	39.852770,-104.726259	39.852770	-104.726259	
14	Radio-R/W 300m	300	2.3	39.852769,-104.724248	39.852769	-104.724248	
15	Radio-R/W 400m	400	2.3	39.852767,-104.722095	39.852767	-104.722095	
16	Radio-R/W 500m	500	2.3	39.852767,-104.720114	39.852767	-104.720114	
17	Dacono-North	400	2.0	40.099182,-104.900929	40.099182	-104.900929	
18	Dacono-South	400	2.0	40.096486,-104.901673	40.096486	-104.901673	
19					none	none	
20					none	none	

Towers less than 100m tall will not have flashing red lights in FS2 – they will each have a steady dim red light.

Water tower locations are not usually identified on vfrmap.com – you’ll have to spot them on Google Maps.

- Add the remaining towers for this project to the Excel file
- Save the Excel file with the same **tower_list.xlsx** file name in the same folder
- Close the Excel file (FS2towerProc.exe will not run if the Excel file is still open)

Step 3) Details

Now the easy part – locate the **FS2towerProc.exe** file in your project folder and run it.

125m dish tower_125m dish tower_0.ttx	12/7/2018 1:40 PM	TTX File	2 KB
125m dish tower_125m dish tower_0.ttx	12/7/2018 1:40 PM	TTX File	9 KB
FS2towerProc.exe	12/10/2018 11:46 ...	Application	21,387 KB
radiotower 70m grey_metal_aluminum_a...	12/7/2018 2:42 PM	TTX File	15 KB
radiotower 70m arev metal seamed.ttx	12/7/2018 2:42 PM	TTX File	7 KB

It will only take 5-10 seconds for the **towerProc** program to update your TSC & TOC files.

radiotower 70m grey_metal_aluminum_a...	12/7/2018 2:42 PM	TTX File	15 KB
radiotower 500m_radiotower 500m_0.ttx	12/7/2018 1:40 PM	TTX File	1 KB
TL_objects.tsc	12/11/2018 7:38 PM	TSC File	5 KB
TL_towerbeacons.toc	12/9/2018 9:31 AM	TOC File	3 KB
TL_towerlights.toc	12/11/2018 7:38 PM	TOC File	11 KB
tower_050m_obj.tmb	12/7/2018 1:40 PM	TMB File	74 KB
tower_051m_nhi.tmb	12/7/2018 1:40 PM	TMB File	17 KB

Time for a test flight!



A special thanks to my son Danny who created the basic **towerProc** Python code to get me started! I hadn't used Python for about 5 years and I had no experience with generating text files – now I'm dangerous!

BONUS HOW-TO, Airport Tower Beacons (for advanced users)

You may have noticed a **TL_towerbeacons.toc** file in your project folder. This file adds 3 flashing green/white airport beacons to 3 airports in the northeast section of Denver. If you want to add flashing airport beacons to your scenery project (highly recommended!), just edit this file with a program like Notepad++ so it references the coordinates of each airport tower.

The **TL_objects.tsc** file in your project folder already references this **TL_towerbeacons.toc** file in the cultivation section so no tsc file changes are needed.

The Basic Process

- Get the lat/lon coordinates of each tower using Google Maps or the FS2 Dev Cam (Cntl-F8, Cntl-F1)
- Update the **TL_towerbeacons.toc** file with these coordinates
- Estimate the tower heights in meters and update that value twice for each tower (white & green)
- Save the file and start FS2 to check the height of each beacon
- Note any up or down adjustments needed, edit the height values, and recheck in FS2

TIP - If the beacon isn't centered on the tower, position the FS2 Dev Cam (Cntl-F8, Cntl-F1) where you want the beacon, then use the Dev Cam coordinates as the new beacon coordinates. You can use the Dev Cam height too, but you'll need to subtract the height at the base (sea level adjustment).

```
<[file][][  
  <[cultivation][][  
    <[string8][coordinate_system][lonlat]>  
    <[list_light][light_list][  
// KDEN tower beacon (Denver)  
  <[light][element][0]  
    <[vector3_float64][position][-104.673679 39.862469 95.000000]  
    <[vector3_float32][color][0.700000 0.700000 0.700000]>  
    <[float32][intensity][100000.000000]>  
    <[vector4_float32][flashing][1.200000 0.000000 200.000000 0]>  
    <[uint32][group_index][0]>  
  >  
  <[light][element][1]  
    <[vector3_float64][position][-104.673679 39.862469 95.000000]  
    <[vector3_float32][color][0.000000 1.000000 0.000000]>  
    <[float32][intensity][100000.000000]>  
    <[vector4_float32][flashing][1.200000 3.000000 200.000000 0]>  
    <[uint32][group_index][0]>  
  >  
// KBKF tower beacon (Buckley AFB)  
  <[light][element][2]  
    <[vector3_float64][position][-104.758864 39.701685 34.000000]  
    <[vector3_float32][color][0.700000 0.700000 0.700000]>  
    <[float32][intensity][100000.000000]>  
    <[vector4_float32][flashing][1.200000 1.000000 200.000000 0]>  
    <[uint32][group_index][0]>  
  >  
  <[light][element][3]  
    <[vector3_float64][position][-104.758864 39.701685 34.000000]  
    <[vector3_float32][color][0.000000 1.000000 0.000000]>  
    <[float32][intensity][100000.000000]>  
    <[vector4_float32][flashing][1.200000 4.000000 200.000000 0]>  
    <[uint32][group_index][0]>  
  >  
// KBJC tower beacon (Broomfield)  
  <[light][element][4]  
    <[vector3_float64][position][-105.120630 39.906433 34.000000]  
    <[vector3_float32][color][0.700000 0.700000 0.700000]>  
    <[float32][intensity][100000.000000]>  
    <[vector4_float32][flashing][1.200000 1.500000 200.000000 0]>  
    <[uint32][group_index][0]>  
  >  
  <[light][element][5]  
    <[vector3_float64][position][-105.120630 39.906433 34.000000]  
    <[vector3_float32][color][0.000000 1.000000 0.000000]>  
    <[float32][intensity][100000.000000]>  
    <[vector4_float32][flashing][1.200000 4.500000 200.000000 0]>  
    <[uint32][group_index][0]>  
  >  
>  
>  
>
```

Beacon Flash Timing / Delays

Most airport beacons flash 20 times per minute or once every 3 seconds so each white / green pair has a 3.0 second offset between their flashes (0.0 sec → 3.0 sec or 1.0 sec → 4.0 sec or 1.5 sec → 4.5 sec). The starting times for the 3 airports are staggered (0.0 sec , 1.0 sec , 1.5 sec) so the 3 towers don't flash in sync.

To add more than 3 towers, copy one of the tower blocks and update the element numbers so the sequence continues (no duplicate element numbers). Then update the coordinates and new tower height. It's okay to reuse existing start times, just make sure that airports with the same start times aren't next to each other.

Time for another test flight!



(kenventions 12/12/18)