

Tutorial

2

THE SCRUFFYDUCK SOFTWARE COMPANY

Airport Design Editor Home Edition

Airport Design Basics

AIRPORT DESIGN EDITOR HOME EDITION

Airport Design Basics: Paths, Parking, and Aprons

© The ScruffyDuck Software Company
www.airportdesigneditor.co.uk
written by Bob Keeshan

Table of Contents

Introduction.....	1
Begin with the End in Mind	2
First Things First.....	4
Adding & Modifying Airport Parking	8
Adding & Modifying Airport Aprons	19

Airport Design Basics

"If you build it, they will come."

Three fundamental design elements of any airport in Flight Simulator X (FSX) are Paths (also called Links), Parking, and Aprons. Paths or links connect the various elements of the airport together. For example after an aircraft lands on the runway, it exits the runway via paths to its assigned parking spot. In FSX, parking is classified generally as either general aviation ramp parking or gate parking. As the term implies, parking provides a place for your user aircraft and AI aircraft to go once they land at your airport. If you do not provide paths, aircraft won't be able to move around your airport. If you do not provide proper parking, ATC and AI traffic will not function properly at your airport.

Aprons, on the other hand, are like the blank canvases used by artists to paint their masterpieces. They don't "connect" to any thing per se, but they do provide the background for almost everything you do at your airport.

This tutorial will provide step-by-step instructions on how to create and to modify paths, parking, and aprons at a stock airport. To follow along, you will first need to install Airport Design Editor Home Edition (ADE) by following the steps outlined in the Installation & Configuration Tutorial. You should also have read through the ADE manual and be familiar with the various functions within ADE. You can download ADE and its manual as well as the tutorial from The ScruffyDuck Software Company or from fsdeveloper.com.

Special thanks to Jon Masterson and to the members of the Airport Design Editor Development Team on fsdeveloper.com for their direction, guidance, and expertise, without which, this tutorial would not be possible.

Begin with the End in Mind

Before you start modifying airport elements and redesigning your first airport, you need to establish an idea of what you want to accomplish. For this tutorial, you are going to make several simple changes to KMGY, or the Dayton-Wright Brothers Airport, located in Dayton, Ohio. Dayton is known as the birthplace of aviation, so it is appropriate that your first airport design project begin there.

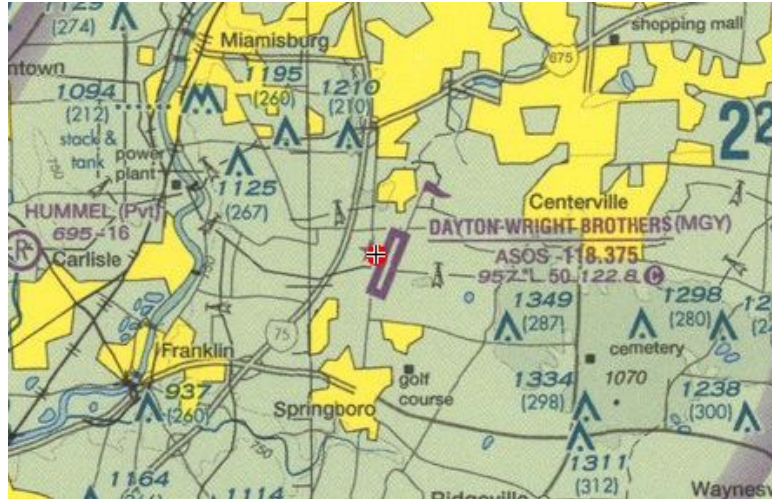
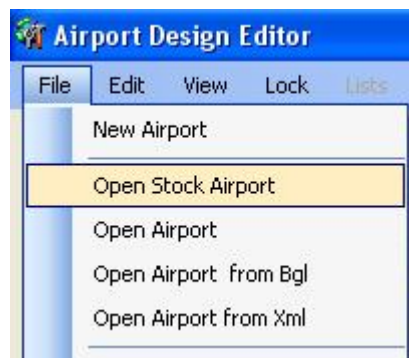


Figure 1 - Sectional View of Dayton-Wright Brothers (KMGY)

Once you select the airport, you need to determine what you want to add and/or modify about the stock FSX airport. The good news is that most FSX stock airports leave a lot of room for improvement, so your options are numerous. In the case of KMGY, you will make several changes to airport parking, taxiways, and aprons.



To begin making your changes to KMGY, you need to first open the stock airport in ADE. To open a stock airport, select Open Stock Airport under the File menu.

Next, choose a stock airport with which to work using the Airport List Screen. For this tutorial, select KMGY by choosing the International Civil Aviation Organization (ICAO) code list button, typing "KMGY" in the field below the list buttons, and either clicking the "Find Now" button to the right or pressing Enter. ADE will then provide the results of your search as "KMGY – Dayton-Wright Brothers."

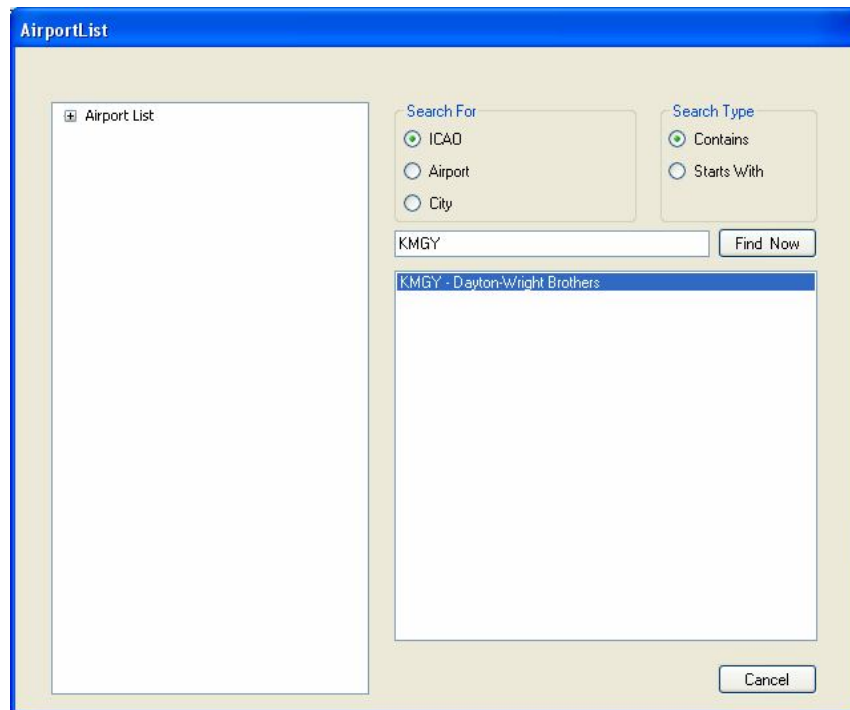


Figure 2 - ADE Airport List Selection Screen

Double click on the results, and ADE will load the stock KMGY airport.



Figure 3 – Stock KMGY Airport in ADE

According to the airport operational statistics, The Dayton-Wright Brothers Airport is home to over 80 aircraft, mostly single engine airplanes. After ADE opens the stock KMGY, you will see that there are only eleven parking ramps and one fuel ramp. By mousing over each parking ramp, you will notice the parking ramps are divided into five small ramps, four medium ramps, and two large ramps. In the future, you can quickly view/edit parking ramp/gate information at an airport by selecting Parking under the List Menu.

First Things First

After you have loaded KMGY in ADE, you next need a template from which to work and to make your changes. Most experienced airport designers use maps, Jeppesen charts, photos, and/or satellite imagery to determine what airport elements they want to add, modify, or remove. For this tutorial, you will use Virtual Earth by going to the following URL:

<http://maps.live.com/default.aspx?cp=39.588972|-84.224861&style=h&lvl=14&v=1>.

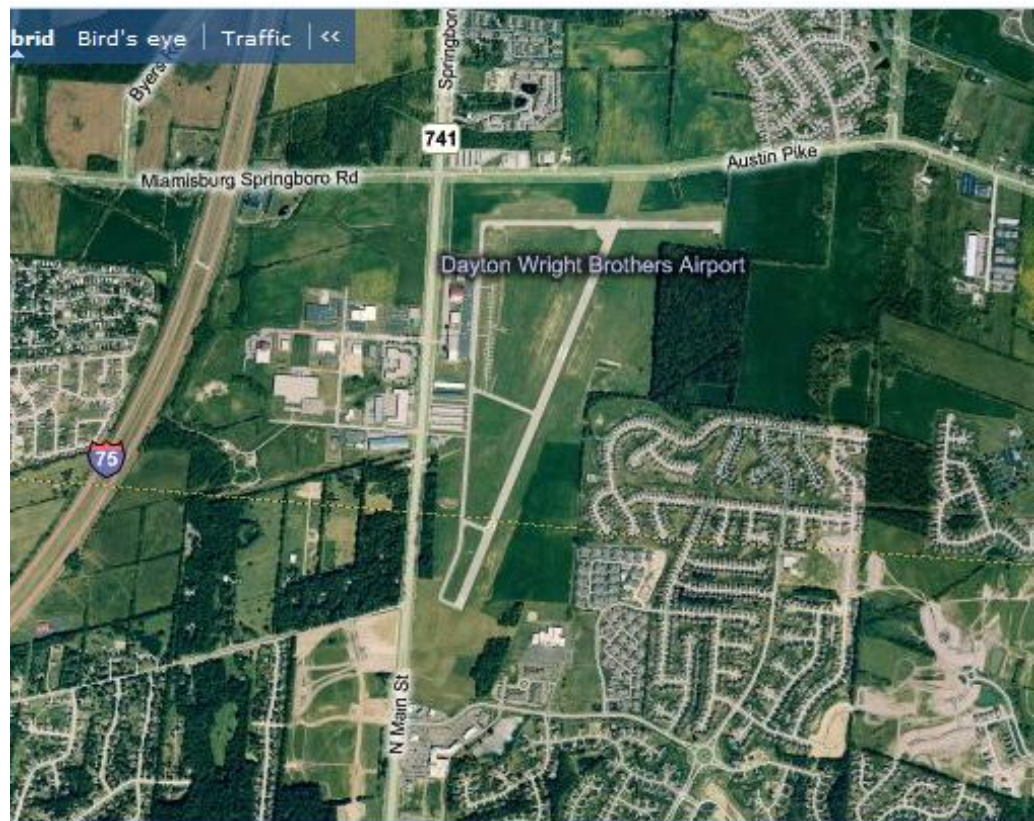


Figure 4 – A view of KMGY via Virtual Earth

A Word of Caution: The airports in FSX are generally current as of 2006. While satellite imagery is readily accessible via Google Earth, Virtual Earth, TerraServer, etc. these images may be several years older than the information in FSX and be out of date. Therefore, make sure you have the most recent information available before making changes to stock airports.

After you've pulled up KMGY using Virtual Earth, zoom in to the Fixed Base Operator (FBO) area in the Northwest part of the airport. You should see something like this:



Figure 5 - KMGY FBO and Parking area (Virtual Earth)

Now, compare that to the same location on the stock airport in ADE.



Figure 6 - KMGY FBO and Parking area (stock FSX airport)

As you can see, the FBO area in the stock FSX airport leaves a lot to be desired. Even notice that where parking exists at the real airport, the stock airport just includes a taxi path that is not even functional! You are going to change that, and this tutorial will show you how.

But, before you start adding parking ramps like crazy and moving/deleting taxi paths, you should first view the stock airport in FSX with the Scenery slider set to Ultra High. This allows you to see what other scenery or autogen objects may impact what you want to do. Although modifying airport elements in ADE is straightforward, sometimes getting them to work with the existing airport scenery can be a challenge. There are programs which you can use to delete, modify, or add airport scenery and landclass, but that goes beyond the scope of this tutorial.

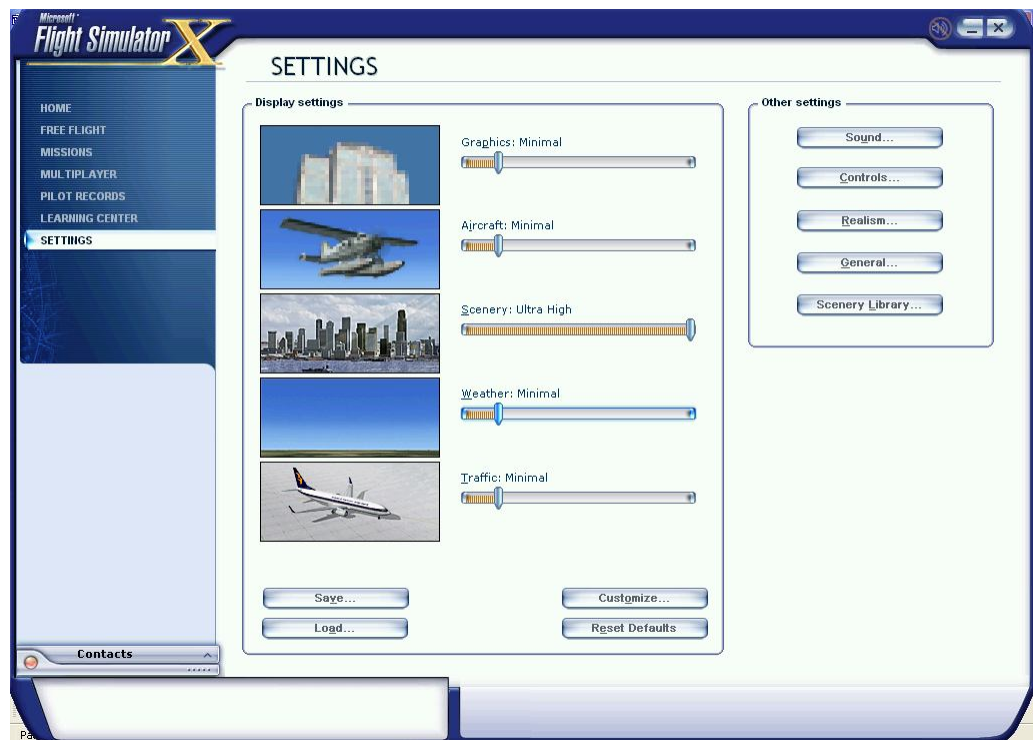


Figure 7 - FSX Settings Screen

After you load FSX, max out your Scenery slider, and select KMGY in free flight, you should see something similar to the picture here:

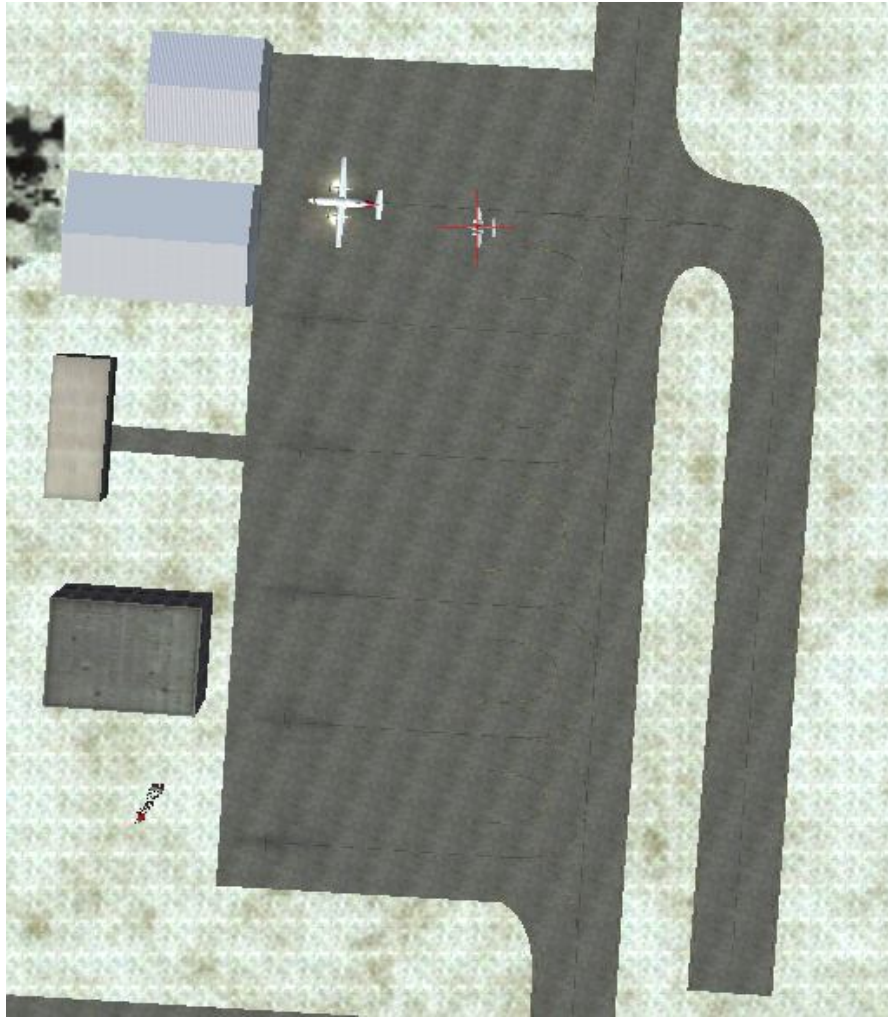


Figure 8 – Stock KMGY Airport FBO in FSX

With the Scenery slider maxed, you can see the airport buildings and beacon next to the FBO apron, and you will notice that useless taxi path to the right of the apron. Again, you are going to change that. And, now that you have taken a look around the airport, it is time to get started.

Adding & Modifying Airport Parking

Look again at the stock KMGY FBO apron in ADE. There are six existing parking ramps here that you can modify to add additional parking and to make the FBO apron look more like the real thing.



Figure 9 - KMGY FBO and Parking area (stock FSX airport)



To align all of your new and modified airport elements, the first thing you need to do is create two Guidelines.

Guidelines are ruler lines that can be laid-down anywhere on the ADE screen. This can be useful, for example, when trying to place several objects in a straight line. Guidelines are proper ADE objects and as such can be added, deleted, moved, rotated, and edited. Undo/Redo also works with them. Guidelines are kept in the .ade file but are not compiled into the .bgl file.

A crossbar marks the guideline's origin, while a small arrowhead indicates the terminal end of the guideline. The tool tip shows length (in user defined units) and the heading taken from the origin to the end.



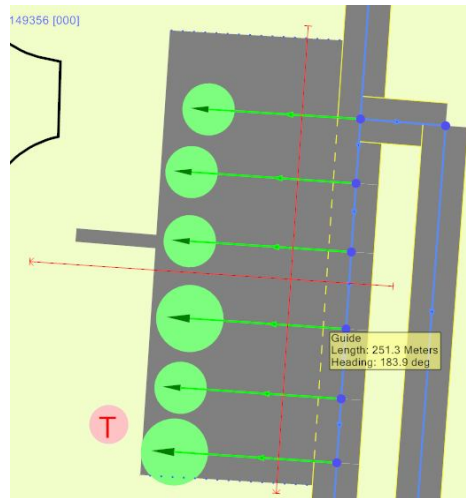


Figure 10 - KMGY FBO Apron with Guidelines

The guidelines you create for KMGY should be long enough to span across the FBO apron, and one should be parallel to and the other perpendicular to the existing taxi path. Use the taxi path as a reference, and draw the guideline down the center of the path. This will create a parallel (or vertical) guideline, which should have a heading of 183.9 degrees. Now you can create a perpendicular (or horizontal) guideline by drawing another and setting it to 273.9 degrees (or $183.9 + 90$). Using these two guidelines, you can now align parking ramps, taxi links, and any new aprons you need to create for this tutorial.

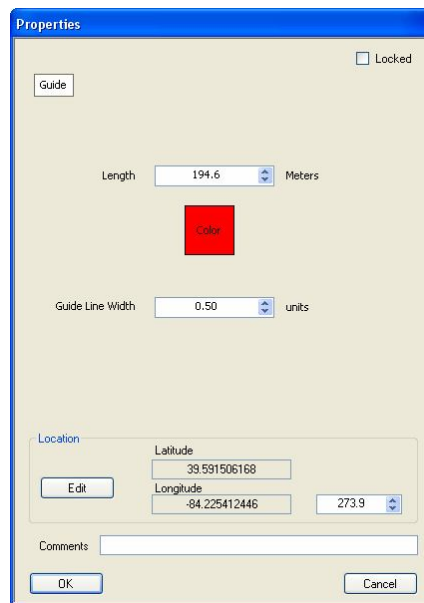


Figure 11 – ADE Guideline Properties Box

To make changes quickly and easily to a guideline, you can either double-click it to bring up the property box, or you can select it and use the rotate handle to quickly change the heading.

Like most objects, you can move a guideline by 'grabbing' it with the mouse and dragging it. You must be in Pointer Mode to do this – select the normal Pointer from the toolbar.

You can delete a guideline by selecting it and pressing the **Delete** key or right click and delete.

You can also Hide or Show guidelines from the View Menu.

The next thing you need to do is change the size of the existing FBO apron parking ramps.

To do this, select the first ramp, and while holding down the **SHIFT** key, select the other ramps as well. After you have selected all the ramps, press **Enter**. This will bring up the Multi-Select Properties Box, where you will make your changes.

In the Type field, select RAMP_GA_LARGE. In the Radius field, enter 11.00 (in meters, or 36.09 feet). Enter 4.00 in the T1 field under Tee Offsets. And finally, enter 273.9 in the Heading field. Click the OK button when finished.

Figure 12 - ADE Multiple Selection Property Box

Your FBO apron should now look like this:

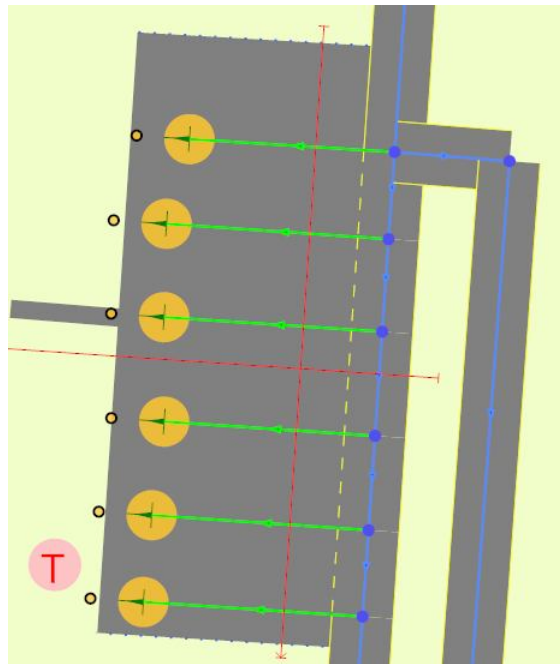


Figure 13 - KMGY Apron with Large Parking Ramps

You may be asking, “Why should I adjust the size of the parking ramps and the tee offsets?” General aviation (GA) parking ramps come in three sizes: small, medium, and large. Which size you choose is based on your airport and the wingspan of the aircraft that frequent your airport.

Nothing larger than a corporate jet or a turbo prop operates out of KMGY. Consequently, GA parking ramps with a radius larger than 11 meters are overkill and waste valuable real estate on the apron.

Tee offsets, on the other hand, are used mainly for aesthetic reasons because regardless of where you position them, they do not impact aircraft behavior.

By default, a "T" is placed at the end of the parking link and positioned at the center of the parking ramp / gate. Tee offsets allow the designer the ability to bring the "T" forward so it becomes more visual. There are four "T" values that you can add, but in the real world there can be more than that.



Figure 14 - Example of real world parking T's

When an aircraft pulls up to a jetway in the real world, the ground crewman looks to see what type of aircraft is entering the parking spot and then based on a "T," the ground crew knows where to stop the nose wheel. This makes sure the plane parks in the correct position, and if a jetway exists, it will align properly to the doors when moved into position by the operator.

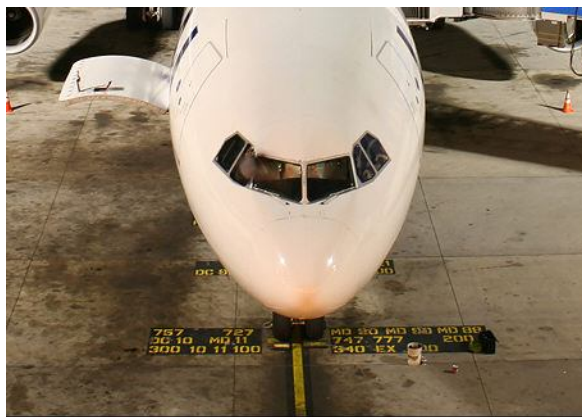


Figure 15 - Example of aircraft tee positioning based on type

Parking tees are not limited to jetway type parking spots, but are also found on general aviation parking ramps for all types of aircraft. The best practice with using tee offsets in FSX is to set them based on the type of aircraft you anticipate will park at the parking gate and/or ramp. As a word of caution, sometimes FSX does not properly display parking tees when the parking spot heading is the same as the connecting parking link. If you encounter this problem, try moving the parking spot a small amount in any direction or adding a node to the parking link outside of parking circle.

Experienced airport designers use generally accepted parking and tee dimensions at their airports. The best practice is to use the following dimensions for general aviation parking ramps instead of the FSX defaults:

Ramp Size	Aircraft	Radius (in Meters)	Radius (in Feet)	Tee Offset
Small	Small single prop planes (e.g. C-172)	5.0	16.40	1.22
Medium	Small twin prop planes (e.g. Baron)	7.0	22.97	2.13
Large ¹	Turbo props (e.g. King Air and Learjet)	11.0	36.09	4.00
Large ²	Very large GA (e.g. DC3 and large corp jets)	15.1	49.54	5.00

If you want more precise parking dimensions by aircraft, Reggie Fields has compiled aircraft specific parking radii and ramp/gate size recommendations that are used throughout the MSFS developer community. You can find more information by going to the links below:

http://www.flightsim2004-fanatics.com/FlightSim/FSX_AI_Parking_FAQ.pdf

http://www.flightsim2004-fanatics.com/FlightSim/FSX_Parking_Matrix_Type.pdf

http://www.flightsim2004-fanatics.com/FlightSim/FSX_Parking_Matrix_MyTraffic.pdf

<http://www.flightsim2004-fanatics.com/FlightSim/FSXWingSpanValues.htm>

To change the default radii in ADE to match these recommended values, refer to page 11 of the Installation & Configuration Tutorial.



After adjusting the size of the parking ramps, you next need to create an Apron Link (or Path) down the center of the FBO apron (using your vertical guideline) that connects to all the parking links. This will allow you to add and align additional parking ramps to the apron.

To add the links, select the Apron Link function on the toolbar and position the crosshair over the top taxipath until it is highlighted and the taxipath tool tip appears. While holding down your left mouse button, drag the crosshair down to the next taxipath until that path is highlighted. Release your mouse button, and ADE will

create a new taxipath between the two existing taxipaths. You will notice that ADE automatically adds two new blue Normal Taxi Points (or nodes) when you connect the new taxipath to the existing paths.

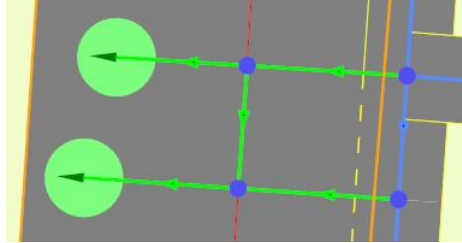


Figure 16 - New Taxipath with Blue Normal Taxi Points

Now, create additional links down the center of the FBO apron by starting each link at the node created by the previous link.

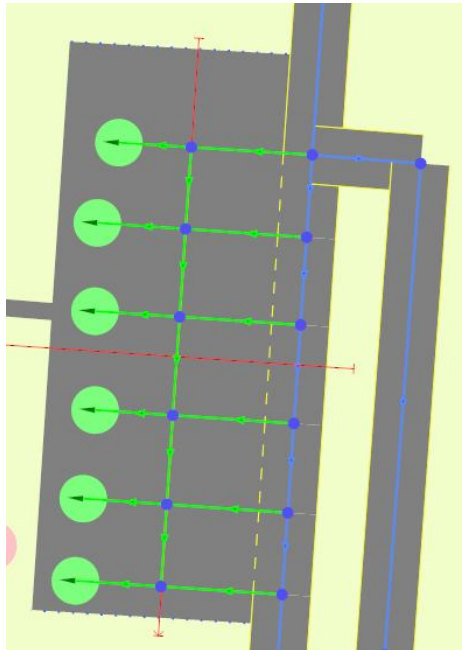
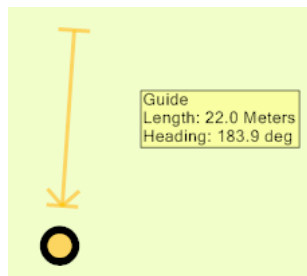


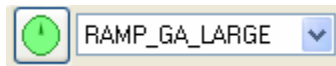
Figure 17 - KMGY FBO Apron with new apron links

Be sure that your new apron links connect to each existing link with a blue node. You can verify that it is connected by hovering over the taxi point. When you place your pointer over a node, any link connected to it will be highlighted. If you create a link that does not connect properly, either click the Undo button or delete it and try again. Usually the existing link will display a tool tip when you mouse over it to indicate you can connect to it.

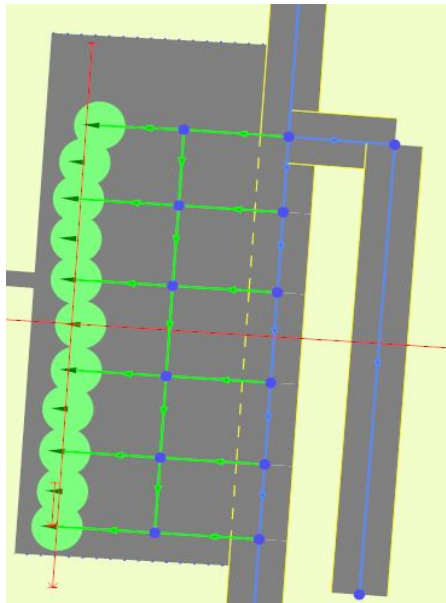
Before going further, you should lock the FBO apron by selecting it and choosing **Lock Object** from the right-click menu. Locking the apron will keep you from moving it by mistake when you are positioning and aligning objects on the apron later.



You will also now want to create another vertical guide (183.9 degree heading) to help you space your parking ramps. In this case, the distance you should use is 22 meters (72.18 feet).



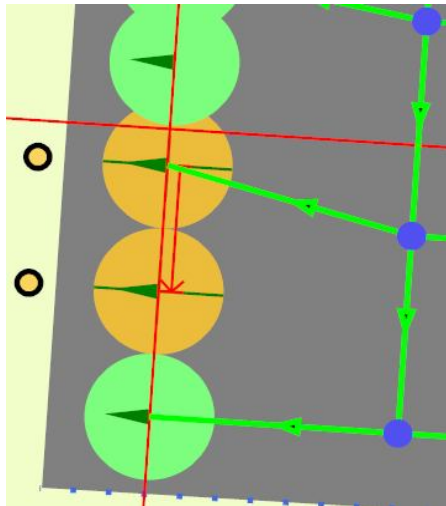
Next, add four new large GA Parking Ramps between the existing ramps.



After creating the new ramps, multi-select them as explained previously and change their properties to match the existing ramps. Now, move your newly created spacing guideline as well as your longer vertical guideline to the first ramp to begin positioning the parking ramps.

You will use the bottom parking ramp as a reference point to align your other parking ramps. Space your first and second parking ramps using your 22 meter spacing guideline, then align the second to the first using the longer vertical guideline.

Figure 18 - KMGY FBO Apron with new Parking Ramps & Spacing Guideline

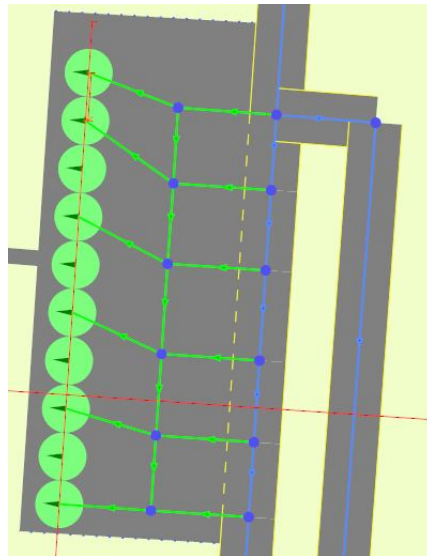


Now you can use the spacer guideline to position your third and subsequent parking ramps. Don't worry about aligning the parking links just yet.

When you space ramps or gates close together, sometimes it will cause an issue with AI aircraft. If parking spots are too close, AI aircraft can sometimes appear to turn into each other as they push back. This issue is more prevalent when using smaller radius parking because the push back distance is shorter.

Figure 19 - Using Guidelines to Align Parking Ramps

When you get all the parking ramps aligned, your FBO apron should look like this.



The next step is to connect your newly aligned parking ramps to the apron links you created earlier. To create new Parking Links, first position your horizontal guideline (273.9 degree heading) on the center of your new parking ramp, select the apron link button on the tool bar, and draw a parking link from anywhere in the ramp area to the center apron link you created earlier. As a word of caution, if the ramp is highlighted when you try to attach the parking link, it will not connect properly.

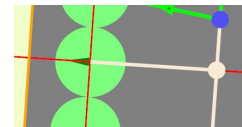
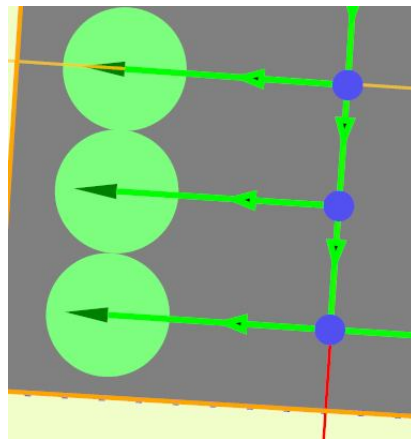
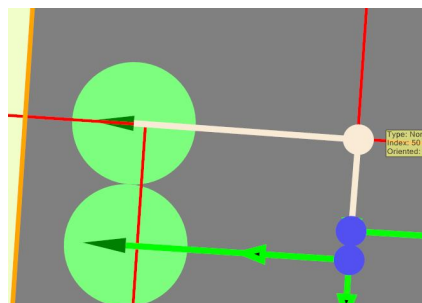


Figure 20 - KMGY FBO Apron with Parking Ramps aligned and spaced properly



Be sure all the parking links are properly connected to both the parking ramp and the center apron link. After creating new parking links, you now need to realign the existing parking links. To align existing parking links, use both the vertical and horizontal guidelines by positioning the vertical guideline on the center apron links and the horizontal guideline on the center of the parking ramp. Now you can move the existing blue normal taxi points into the correct position by selecting them with your pointer and dragging them.



For the last existing parking link, you will need to add a normal blue taxi point (or node) to the center of the link by using the Add Normal Taxi Point tool bar icon. (As a general rule, nodes should only be added to existing taxi links.) Once you add the node, position it up and over using both guidelines.

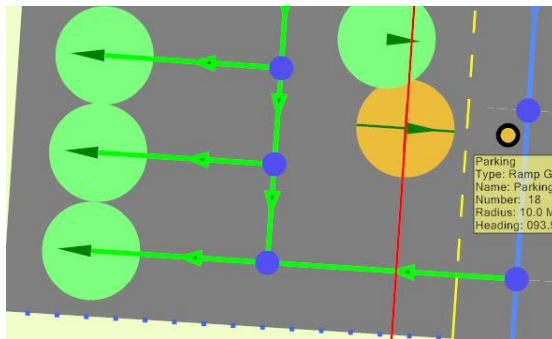
Once you have aligned the parking links, you should delete the unneeded links to the right. When deleting these existing apron links, start at the bottom right and work up. You will keep the first and the last apron links, but delete the ones in the middle.



To delete an apron link, just select the link and press your delete key. If you accidentally delete the wrong link, click the Undo button. When you have completed adding, positioning, and deleting the parking links, your KMGY FBO Apron should look similar to this.

Figure 21 - KMGY FBO Apron with aligned parking links

Next, we want to add additional parking on the East side of the FBO apron. To do this, add six more large GA parking ramps to the right of your center apron links. Once again, multi-select these new parking ramps, and change their properties to match the others, except this time use a heading of 93.90 degrees (273.9 - 180). Use your vertical guideline to align the bottom parking ramp close to the main taxi path and make sure it is aligned between second and third parking ramps on the West side of the FBO apron.



Using the same techniques described earlier, begin spacing and aligning these new parking ramps using the spacer and vertical guidelines, and connect them to the center apron links using the horizontal guideline.

After completing these steps, your FBO apron should look like this:

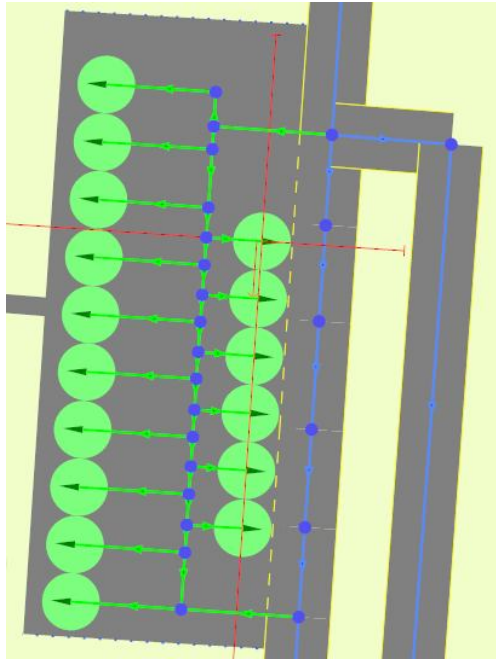


Figure 22 - Completed KMGY FBO Apron

Properties

Multiple Selection ☐ Locked

Link

Designator: Blank

Width: 22.00 Meters

Left Edge

NONE ☐

Center

Line ☒ ☐

Right Edge

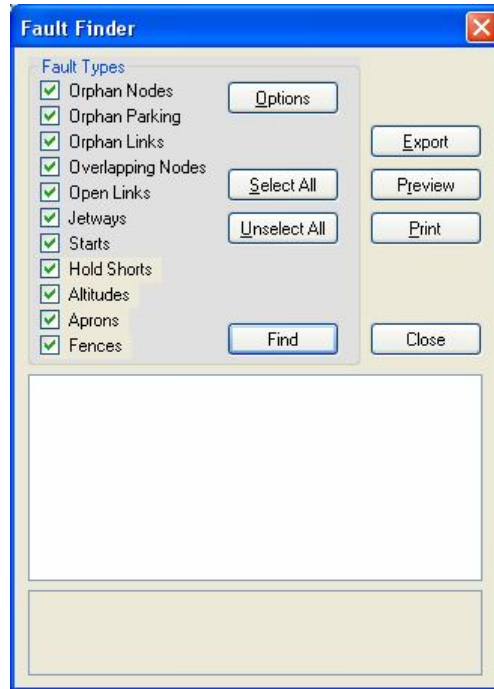
NONE ☐

Comments:

Figure 23 - Apron Link Multi-Select Properties

To finish off the changes you have made to the KMGY FBO apron, you should multi-select all the apron and parking links, and make sure their width is set to 22 meters (72.18 feet) and the Center Line box is selected. This will ensure every thing looks uniform on the apron when you view it in FSX.

Before you forget, go ahead and save your work by going to the File Menu and selecting Save Airport. This will create an ADE file that includes the guidelines you created so that you can use them again the next time you load this airport in ADE.



If you want to review your handiwork thus far in FSX, you should run the ADE Fault Finder under the Tools Menu. The Fault Finder will catch airport design errors and allow you to correct them before compiling. If you do not run fault finder, you risk FSX not properly loading the airport due to a compiler error.

Figure 24 - ADE Fault Finder

After running Fault Finder and correcting any design faults, select Compile Airport under the File Menu. This command will compile your work into a .bgl file that you can then place into your Microsoft Flight Simulator X / Addon Scenery / scenery folder. The next time you load FSX, the program will index your new file so that when you go to the airport in free flight, you will see the changes you just made. Be careful not to compile airport changes while FSX is running. Doing so may result in an error message and the loss of your modifications. Therefore, you should make it a practice to Save Airport often and Compile Airport only when not running FSX.

Adding & Modifying Airport Aprons

An airport apron is like a canvas on which an artist paints his or her picture. In your case, you used the existing FBO apron to add links and parking ramps to make the airport look and function more like the real airport. However, to complete the next series of modifications to KMGY, you will need to create and position additional airport aprons.

Remember that useless taxi path to the right of the FBO Apron? You are now going to turn that into a parking lot for airplanes, just like at the real airport.

Before we begin, take another look at the Virtual Earth image of KMGY in bird's eye view. You will notice that the taxi path used for parking is about half the width of the main taxi path. Now switch over to the ADE view of KMGY. The width is the same as the main taxi path (24.38 meters). Also notice that the parking taxi path is about three widths away from the main taxi path in the VE image, whereas it about one width away in ADE.

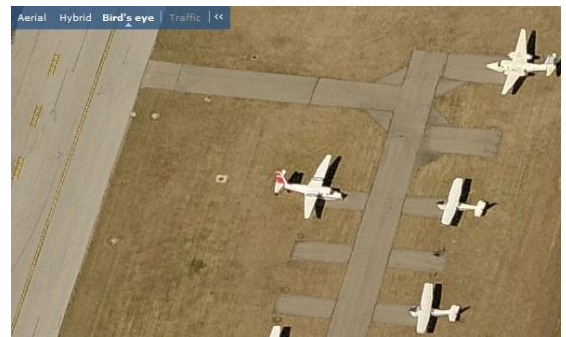
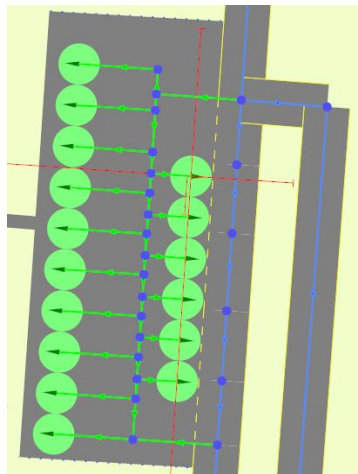
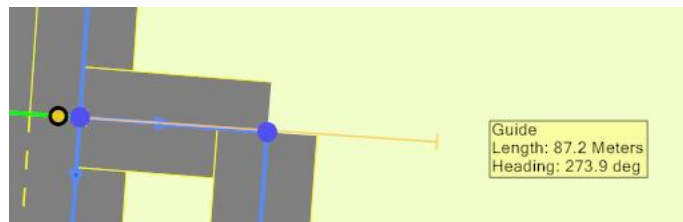
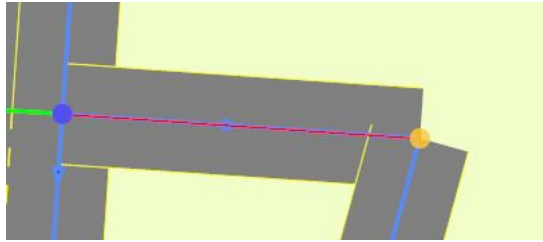


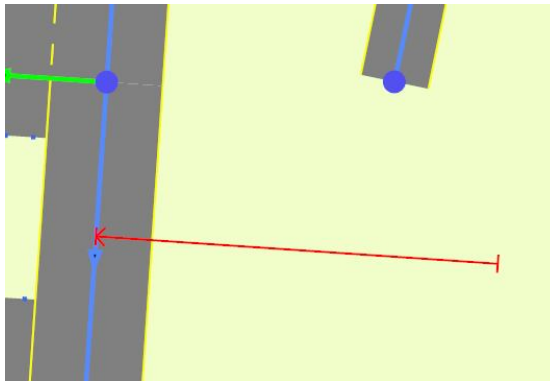
Figure 25 - ADE and Virtual Earth Views of the Parking Taxi Path

To adjust both the width and spacing of the parking taxi path, first create a guideline that is 87.2 meters (286.09 feet) long, with a heading of 273.9 degrees. Next, position the end of the guideline on the center of the blue normal taxi node that connects the main taxi path to the parking taxi path.

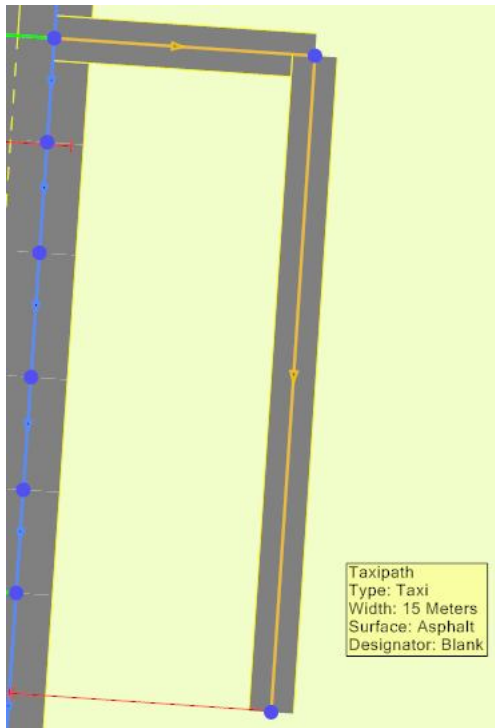




Now, move the parking taxi path to the right until the connecting blue normal taxi node is even with and centered on the right end of the guideline.



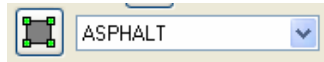
Next, reposition your guideline between the FBO apron and apron below it and align the left end on the center on main taxi path. You can now select the blue normal taxi point at the end of the parking taxi path and position it on the right end of the guideline.



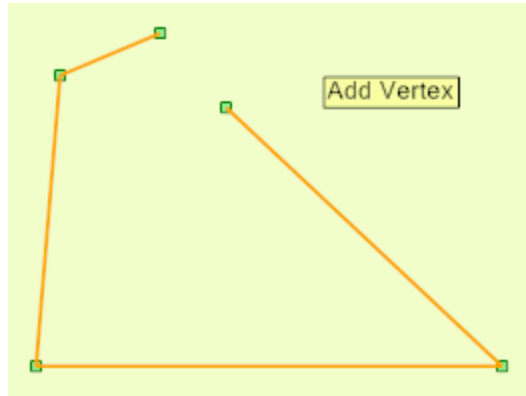
You have one more thing to do to the parking taxi path before you move on. Multi-Select both the connecting taxi path and the parking taxi path and open the Properties Box by pressing Enter. Change the width from 24.38 meters to 15 meters (49.21 feet), and click OK. If you have completed all these steps successfully, the parking taxi path should look like this.

You are now ready to add your aprons.

Figure 26 - Repositioned and Resized Parking Taxi Path



Adding aprons to your airport is straight forward using the ADE tool bar. Select the apron surface you want using the drop down selection box, click on the apron icon button, and start placing apron vertices.

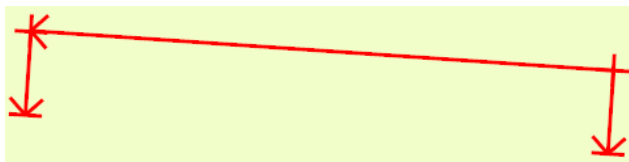


An apron needs at least three vertices, but can have as many as you need. Once you are done placing your vertices, place the last vertex on the first vertex you created to complete the apron, or double click on the final point and ADE will close the apron for you.

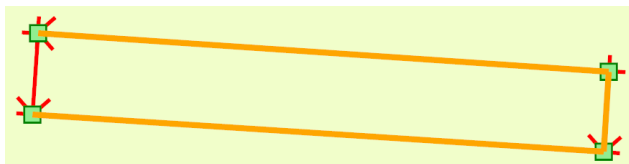
While creating aprons is easy, sizing and aligning your aprons is somewhat tricky. To facilitate the creation of your parking aprons for KMGY, you are once again going to use guidelines. You will need to create three additional guidelines that will serve as the frame for your parking aprons:

- Guideline 1 – heading 273.9, length 70 meters (229.66 feet)
- Guidelines 2 & 3 – heading 183.9, length 12 meters (39.37 feet)

Next, you should align the ends of the two smaller guidelines to the ends of the longer guideline.

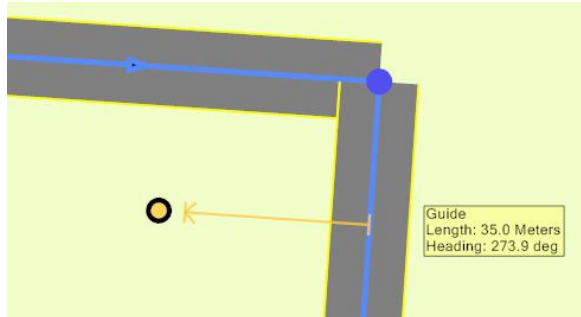


You will use the four corners of this frame to place each of your apron vertices. For your KMGY aprons, you will want to select asphalt as the surface type.

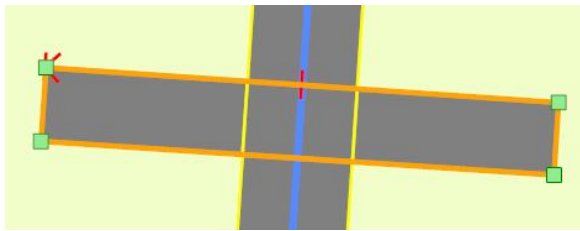


Place the last vertex over the first one, and ADE will create your first apron.

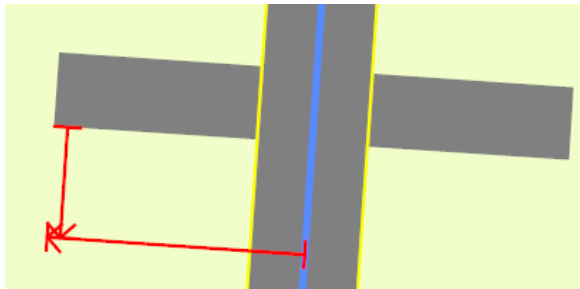
To correctly position your parking aprons under the parking taxi path, take the guideline you used earlier to position the parking taxi path and resize it to 35 meters (114.83 feet).



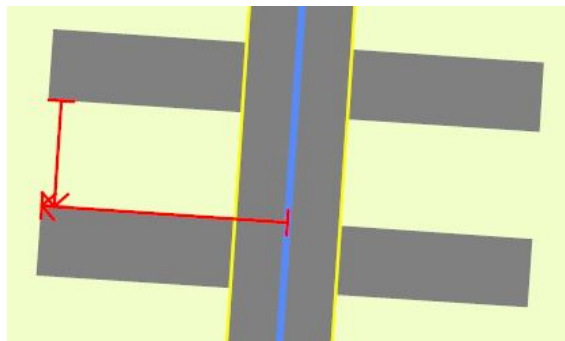
Next align the right end of the guideline on the center of the parking taxi way, a little below the connecting taxi path.



Now, move the parking apron you just created by clicking in the center of the apron, and with your left mouse button depressed, drag the apron over to align it with the guideline.



Create one more guideline -- this time with a heading of 183.9 degrees and a length of 15 meters (49.21 feet). Align the end of this second guideline to the bottom edge of the apron you just positioned, and move the first guideline down, keeping it aligned with the center of the taxi path.



Next, create another asphalt apron using the guideline framework, and align it to the two guidelines. Once the second apron is positioned correctly, move the two guidelines and repeat the process until you have created and properly positioned seven parking aprons.

If you have completed the above steps successfully, the parking taxi path and aprons should look like the picture below:

Now it is time to add parking ramps to these aprons so that your AI aircraft will park like the aircraft appear in the Virtual Earth bird's eye view.

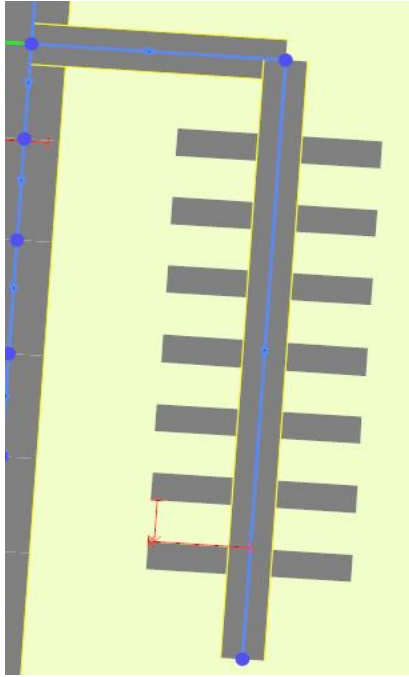
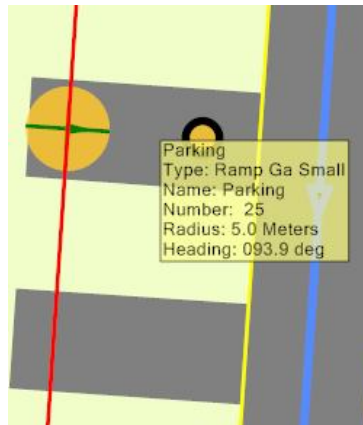


Figure 27 - Completed Parking Taxi Path with Aprons

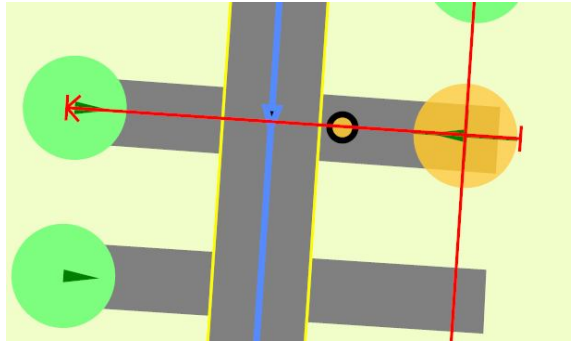
Next, you will need to create 14 small GA ramps with a radius of 5 meters (or 16.40 feet): 7 with a heading of 273.9, and 7 with a heading of 93.9. Remember to use the multi-select function to save yourself some time.



Now, reposition the original long vertical guideline, which you created at the beginning of this tutorial, a few meters within the outer edge of the parking aprons you just created and align your first parking ramp using that guideline.

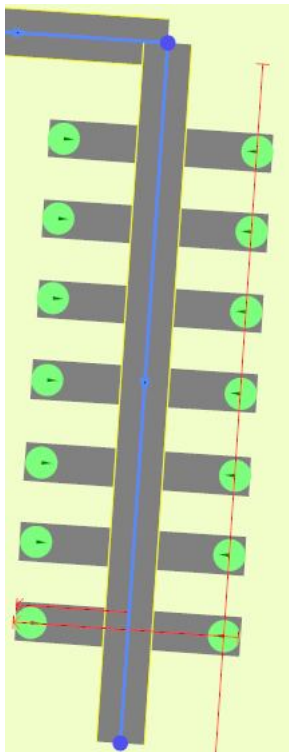
For the parking aprons on the west side, you will use the parking ramps with the heading of 93.9 degrees. Be sure to center each ramp on the parking apron. Once you have placed and aligned all the west side parking ramps, reposition the long vertical guideline and repeat the process on the east side using the ramps with the 273.9 degree headings.

To help in the alignment process, you can use the 70 meter guideline you created earlier to build the parking aprons.



Position it at the center of your West parking ramps, and align the East parking ramps with both the vertical guideline and this guideline.

If you have done the preceding steps correctly, your modified parking taxi path will look like this:



The final step is to connect your new parking ramps via parking links to the parking taxi path. Again, you can use the 70 meter guideline you created to align the parking links for both the East and West parking ramps. To create parking links, following the steps outlined previously on pages 12 and 13 of this tutorial.

Once you have connected all the parking ramps to the taxi path, multi-select the parking links, set the width to 10 meters, and make sure the Center Line box is checked. This will ensure all the parking lines are uniform when viewed in FSX.

By placing the parking ramps in this fashion, AI aircraft that spawn at your airport will face the direction indicated by the parking ramp heading. However, when an AI aircraft lands at your airport and parks at one of these parking ramps, it will face the opposite direction because the parking link is connected to the front of the parking ramp.

If you have followed along with this tutorial, your KMGY FBO area in ADE should resemble the picture below:

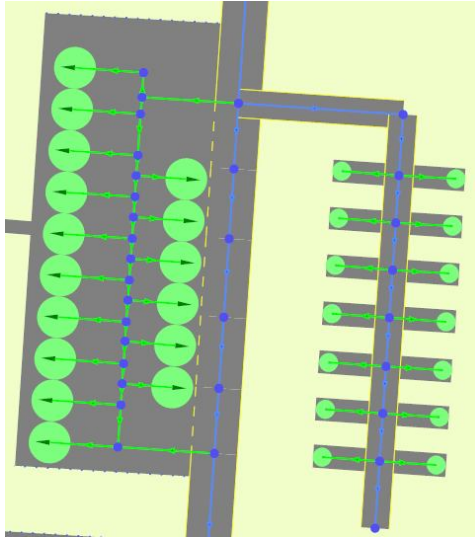


Figure 28 - Completed KMGY FBO Area

If your ADE KMGY schema looks different, review this tutorial again to find where you may have overlooked a step or made a mistake. If everything looks good, go ahead and run the fault finder and select Save Airport from the File Menu. After ADE saves the airport, select Compile Airport, place the .bgl file into the FSX add-on scenery folder, and start FSX.

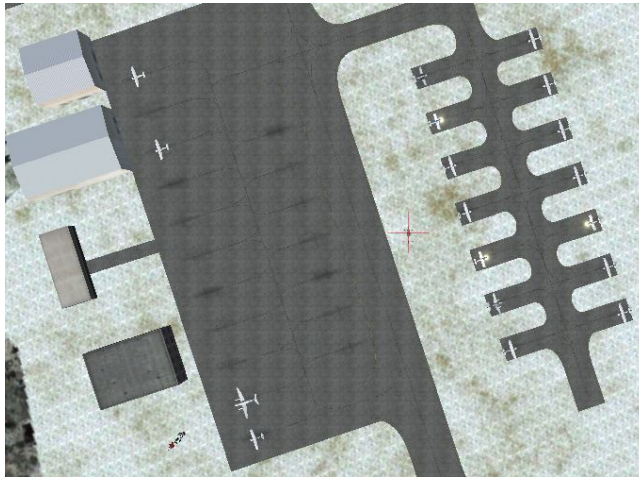


Figure 29 - Final KMGY FBO Apron Area in FSX

Congratulations on completing Tutorial 2: Basic Airport Design – Paths, Parking, and Aprons. You have just expanded the parking at KMGY from eleven parking ramps to over 30 ramps.