



HangarStack™ User Guide

Version 2.20

Section 1: Introduction

HangarStack is a web-based/cloud-based application which enables you to create layouts of aircraft and other objects in conjunction with hangar and ramp graphics. Data is stored on the HangarStack server, enabling you to access your site via any desktop, phone, or tablet (phone use is not recommended, due to the small-size screen). All objects in HangarStack are drawn to-scale, providing accurate depictions of layouts.

Section 2: Main Menu Screen

Your ramps and hangars are listed here for selection. Be sure to read the End User License Agreement, which stipulates terms of use.

The **CONTINUE** button proceeds to the Layout Screen.

CAUTION!

HangarStack is used in a web browser. If you refresh the browser screen, the entire HangarStack application re-loads, and you could lose the current Layout data in your Layout. Do not click the refresh button in your browser unless necessary.

NOTE

We recommend the Chrome browser for best results.

Section 3: Layout Screen

The selected ramp or hangar is shown here, and you'll place aircraft and other objects on this screen. A Layout is a ramp or hangar graphic that contains aircraft and other objects on it. Layouts can be saved and opened (i.e., retrieved). A given ramp or hangar can have many different Layouts, enabling you to generate different scenarios of aircraft placements.

Below is a description of the various buttons, taken in order of typical use.

ADD AIRCRAFT [top] is used to add aircraft and other objects, such as Ground Support Equipment, to the current Layout. When clicked, the Aircraft Database

loads. Over 550 aircraft and other objects are contained in the Aircraft Database, all drawn accurately to-scale.

To add an aircraft manually: Choose Manufacturer > Choose Aircraft > provide a Registration > select the colored Priority > and type any Notes. You can select from any of the 10 colored Priorities, and you can customize each color in the PREFERENCES screen. If you want to retrieve the selected aircraft quickly and easily in the future, select **“Remember this aircraft.”** When ready, click **CONTINUE**.

To search for an aircraft type: In the Search window (bottom), enter a search term. It is best to use smaller search terms. For instance, do not enter "KINGAIR," but rather enter "KING." Or, do not enter "HS125," but rather enter "125." Next, click **SEARCH**. Choose the aircraft from the Search list > provide a Registration > select the red/yellow/green Priority > type any notes, and click **CONTINUE**.

CAUTION!

Aircraft are drawn in HangarStack showing a certain configuration and might not represent variable features, such as winglets, tip tanks, speed mods, and other items that can vary among aircraft types. The actual aircraft you are working with in your operation might differ dimensionally from that shown here. Use caution, and take all precautions when moving actual aircraft to account for these potential variations to prevent damage.

NOTE

The Search function, described above, can be especially helpful, because many aircraft have changed manufacturers over time. For instance, a King Air turboprop aircraft might be referred to as a Beech, Beechcraft, Raytheon, etc. By using the Search function for "King," instead of using the Manufacturer > Aircraft method, it may be easier to find the aircraft you are looking for.

NOTE

Some Ground Support Equipment (GSE) is included in HangarStack. In the ADD AIRCRAFT window, under Manufacturer, select Ground Support Equipment > select the equipment > specify the details on the right side of the screen, as though you are adding an aircraft. When the GSE is added to the Layout, you can move it around just like an aircraft object.

To load a Remembered Aircraft: In the **“Enter Registration”** input field next to the **ADD AIRCRAFT** button, type the registration (tail number) of the aircraft that you previously “remembered” using the “Remember this aircraft” feature. It is not case-sensitive, and you do not need to enter dashes [i.e., British registration of G-ALYP can simply be entered as galyp]. Then, click **ADD AIRCRAFT**. The Remembered Aircraft will be added to the Layout. The list of Remembered Aircraft can be viewed in **PREFERENCES > REMEMBERED AIRCRAFT**, and you can delete from that list on that screen.

When your aircraft appears in the Layout, you can select it by LEFT-clicking it. A blue Tow Target appears, enabling you to LEFT-click-drag the aircraft around to different positions. The blue Tow Target simulates a towing process, whereby the aircraft pivots around the main landing gear, being rotated by the front nose wheel.

When an aircraft is selected (i.e., light blue), the details are shown at the bottom of the screen, including aircraft type, notes, length, width, height, etc. If you mouse-over any aircraft, the type and Notes are displayed. You can also view the Notes for the selected aircraft at the bottom of the screen. If the Notes are too lengthy, you can mouse-over the Notes to see a pop-up window.

The aircraft has a Datatag that displays Registration, Priority, Heading, Date, and Time.

Some Layouts are larger than the screen can show. For very large Layouts, use the Zoom control and scrollbars on the bottom and right sides of the screen to scroll to different locations. You can also use the mouse wheel to zoom in and out, and you can click-and-drag the hangar or ramp to pan position around the screen.

DELETE AIRCRAFT [top] deletes the currently-selected (i.e., light blue) aircraft from the Layout. However, it does not delete it from any saved Layouts, unless you save the current Layout.

EDIT DETAILS [top] allows you to edit the currently-selected aircraft's details, similar to the details that were entered when the aircraft was first added.

FIND AIRCRAFT [top] is used to locate a particular aircraft in the current Layout. Just specify the registration number, and the aircraft will be shown.

SAVE LAYOUT [top] is used to save the current Layout. All aircraft and objects shown on the current hangar or ramp graphic are saved to the server/cloud. You may save as many Layouts as you wish for a given hangar or ramp. The Save Layout window lets you save the current Layout to the existing name or to a new name.

OPEN LAYOUT [top] is used to open a saved Layout. When clicked, HangarStack will load the aircraft and objects for that Layout, positioning them to their saved positions.

DELETE LAYOUT is used to delete the selected Layout.

"Add the selected Layout to the existing aircraft on the screen", when NOT selected removes ALL aircraft from the screen and loads the chosen Layout. If selected, all aircraft currently on the screen remain, and aircraft in the new loaded Layout are added to the existing aircraft on the screen.

CHANGE (very top of the screen) is used to change to a different hangar or ramp.

PRINT LAYOUT [top] opens your browser's Print function. There, you may set printing options much like printing any document.

NOTE

We recommend the Chrome browser for printing.

NOTE

To print to a PDF, which might be most useful for large-format printers, please consider using the Chrome browser. In Chrome's Print function, under Destination, click Change > Save As PDF. You can specify the paper size, and you can use the percentage zoom control to fit the Layout onto the size document you are using. Proceed to print the screen like any document; the Chrome browser will prompt you for a folder/file location and name to save your Layout image as a PDF.

TECH SUPPORT [top] will open a new browser window containing HangarStack technical support information.

ZOOM [bottom] is used when a given ramp or hangar graphic is larger than the screen allows. Drag the slider left and right to change the Zoom value. You can also use the mouse wheel to zoom in and out.

HIDE DATATAGS [bottom] will hide or show all Datatags for aircraft in the current Layout. This selection also carries through to the PRINT function.

SHOW SPACING OUTLINE [bottom] will hide or show a 3-foot (approx. 1 meter) spacing outline around each airplane. The outline has three rings that are 1 foot wide each: a 1-foot, 2-foot, and 3-foot outline. Clicking the "Show Spacing Outline" checkbox once enables 50% transparency of the outlines; clicking again fully shows the outlines; clicking again turns the outlines off. Use the 50% transparency feature in situations where you need to obtain, say, a 2-foot distance between aircraft. The transparency allows you to visually overlap the outlines of two aircraft so that a 2-foot distance is obtained.

PREFERENCES [bottom] will open a window that lets you specify various options. These Preferences are applied for all Hangars and Ramps throughout your site.

PRIORITY COLOR CODES are shown at the top. There are 10 input fields where you can enter custom values.

ENABLE MOUSEWHEEL ZOOM AND MOUSE DRAG PANNING turns on/off the ability to zoom and drag the Hangar or Ramp graphic using your mouse. For Apple Mouse users, it can be helpful to turn this feature off.

USE DARK COLOR SCHEME provides a light or dark color scheme.

SHOW AIRCRAFT NOTES DURING MOUSEOVER turns on/off the ability to show Notes when you mouseover an aircraft on the screen.

SHOW SUBSPACES shows/hides Subspaces. For more information, see Section 4: Usage Tips.

REMEMBERED AIRCRAFT opens a window where you can view the list of Remembered Aircraft and delete them as needed.

RATE FIELDS allow you to enter three Rates in any currency you want. Rates can be calculated using the “L x W” checkbox by specifying that aircraft square footage [meters] should be calculated via length x width or aircraft footprint. Meters can also be selected for square meters calculations.

NOTE

If you change rates, they will not be reflected on the currently-selected aircraft. Click another aircraft, and then the new rates will be reflected.

PRINT DETAILS (bottom) will open a window that lists all aircraft in the current Layout.

OPEN IN PRINTER VIEW will open a new browser window that is black-and-white and suitable for printing. This printout can be helpful to give to line staff, to review Note, Priority, etc.

Section 4: Usage Tips

Printing To PDF

To print to a PDF, which might be most useful for large-format printers, please consider using the Chrome browser. In Chrome's Print function, under Destination, click Change > Save As PDF. You can specify the paper size, and you can use the percentage zoom control to fit the Layout onto the size document you are using. Proceed to print the screen like any document; the Chrome browser will prompt you for a folder/file location and name to save your Layout image as a PDF.

Subspaces

A Subspace is a sub-section of a hangar that specifies a height limit. For example, consider a hangar that has two bays, with a Bay 1 maximum height of 35' and a Bay 2 maximum height of 45'. If you drag an aircraft with a height of 37' into Bay 1, a red Height Warning will appear at the bottom of the screen. If you drag the aircraft into Bay 2, a yellow Height Caution will appear. By default, Height Cautions are generated when an aircraft is within 10' of a hangar maximum height, and Height Warnings are generated when an aircraft is within 5' of or exceeds the maximum hangar height. These values can be customized for your operation. If you wish to use Subspaces for your hangars, or you need different Height Caution and Warning values, notify the HangarStack team to make those changes. The Subspaces for your hangar graphics can be viewed by selecting them in **PREFERENCES**.

Aircraft Rates

HangarStack can calculate a hangar/ramp fee for each aircraft, based on the aircraft's square footage. In the **PREFERENCES** window (lower right corner), you can specify up to three rates. Your rates can be in pounds, dollars, etc., however do not use a pound or dollar symbol. Only use x.xx format, such as 5.50 or 13.35.

The rates you enter can represent anything your operation requires: rate per day, rate per month, weekend rate, daily rate, hangar rate, ramp rate, etc. When an aircraft is selected, its information is shown at the bottom of the screen.

In **PREFERENCES**, Rates can be calculated via 1) aircraft length x width or 2) aircraft footprint.

The aircraft footprint method is described below. To explain, the square footage of each aircraft is calculated as shown:

Example: Dassault Falcon 10

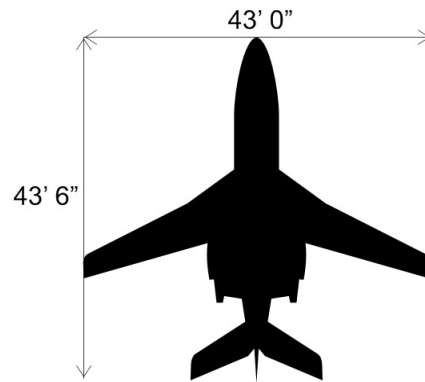
Square footage is determined by the actual footprint area of the geometric shape of the aircraft.

Square footage = 477 sq. ft.



Square footage is NOT determined by multiplying width x length:

$$W \times L = 1871$$



To explain the rates, if the following rates of 1.50, 5.55 and 10.33 were entered in PREFERENCES, the Falcon 10's rates would be:

$$1.50 \times 477 = 715.50$$

$$5.55 \times 477 = 2647.35$$

$$10.33 \times 477 = 4927.41$$

As stated, rates can be anything you require. It may be necessary to enter rate values that are different from your true rates to arrive at the calculated fee that matches what your operation needs to charge the customer.

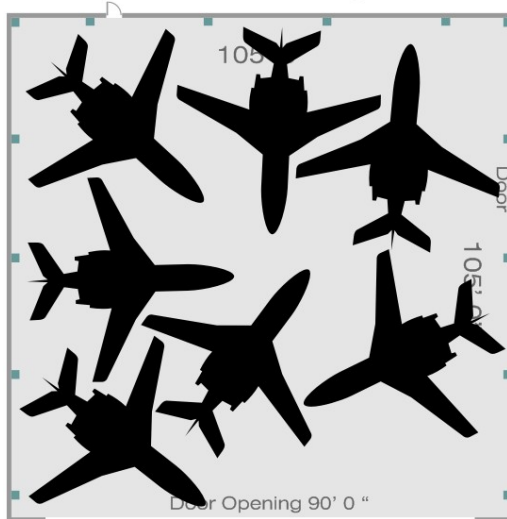
For instance if a daily ramp fee for a Falcon 10 needs to be \$1,200, a rate of 2.51 can be entered to calculate the fee you ultimately need.

We'll explain the percentage use figure at the top of the screen. Consider that an aircraft has an imaginary bounding box, represented by its width and length. The logic behind using the actual footprint area of the geometric shape of the aircraft, instead of width x length [i.e., the imaginary bounding box concept] is because aircraft are frequently moved into the "empty" areas of another aircraft's imaginary bounding box. That would not represent an accurate way of calculating square foot usage percentage.

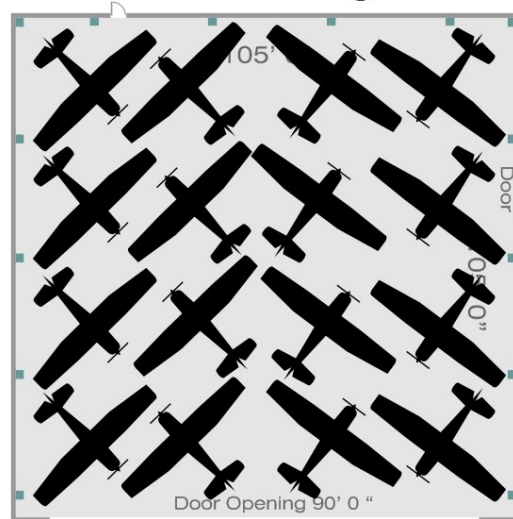
To explain, in the example below, the hangar is 11,025 sq. ft. We can fit seven Falcon 10s, but not eight. Seven Falcon 10s x 477 sq. ft. = 3,339 sq. ft. In this case, $3,339 / 11,025 = 30.3\%$ hangar usage.

Likewise, we can fit sixteen Cessna 152s in the same hangar to arrive at 32.1% hangar usage. Both figures are very similar, yet one has seven aircraft and the other has sixteen.

Hangar is 11,025 sq. ft.
Seven (7) Falcon 10s
at 477 sq. ft. each
= 30.3% usage



Hangar is 11,025 sq. ft.
Sixteen (16) Cessna 152s
at 221 sq. ft. each
= 32.1% usage



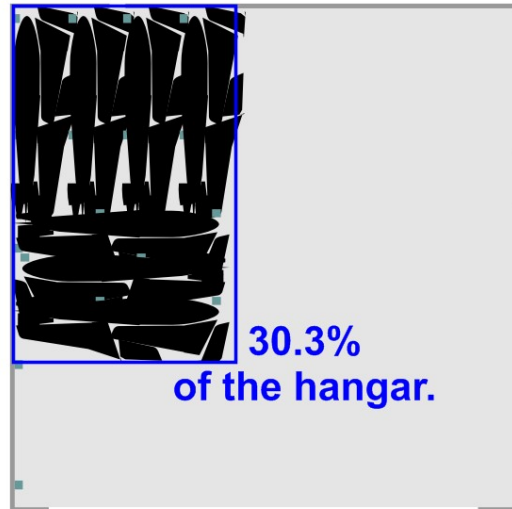
When analyzing the percent usage figure at the top of the screen, understand that it is a relative value. 30% usage is likely a good value for a hangar full of Falcon 10s. The key is to visually look at the Layout of aircraft on the screen and analyze the percent usage figure to determine if it's an acceptable value. If it visually looks like space is available, move aircraft as needed to arrive at a more efficient layout. The percent usage figure can be used to compare the effectiveness (or efficiency) of one Layout versus another Layout.

Here's another way to explain the calculation of percent usage. Again, note the hangar with seven Falcon 10s. If we disassemble all seven Falcon 10s and put them in the corner, they'll occupy 30.3% of the available space.

Hangar is 11,025 sq. ft.
Seven (7) Falcon 10s
at 477 sq. ft. each
= **30.3% usage**



If we disassemble
all seven Falcon 10s,
they occupy
30.3% of the hangar.



Due to the geometry of aircraft, combined with the complexities of fitting aircraft into a hangar, it is impossible to achieve a percent usage of 100% based on square footage. However, it is possible for a hangar to be considered "full" with a percent usage of only 30.3%. The takeaway is that percent usage is a relative figure which must be "biased" by the operator. In some cases, a percent usage of 30% would be decent and acceptable; in other cases, it might be far too low. It all depends on the size of the aircraft being fitted and how they're arranged. Ultimately, the operator must determine the effectiveness of a given Layout.