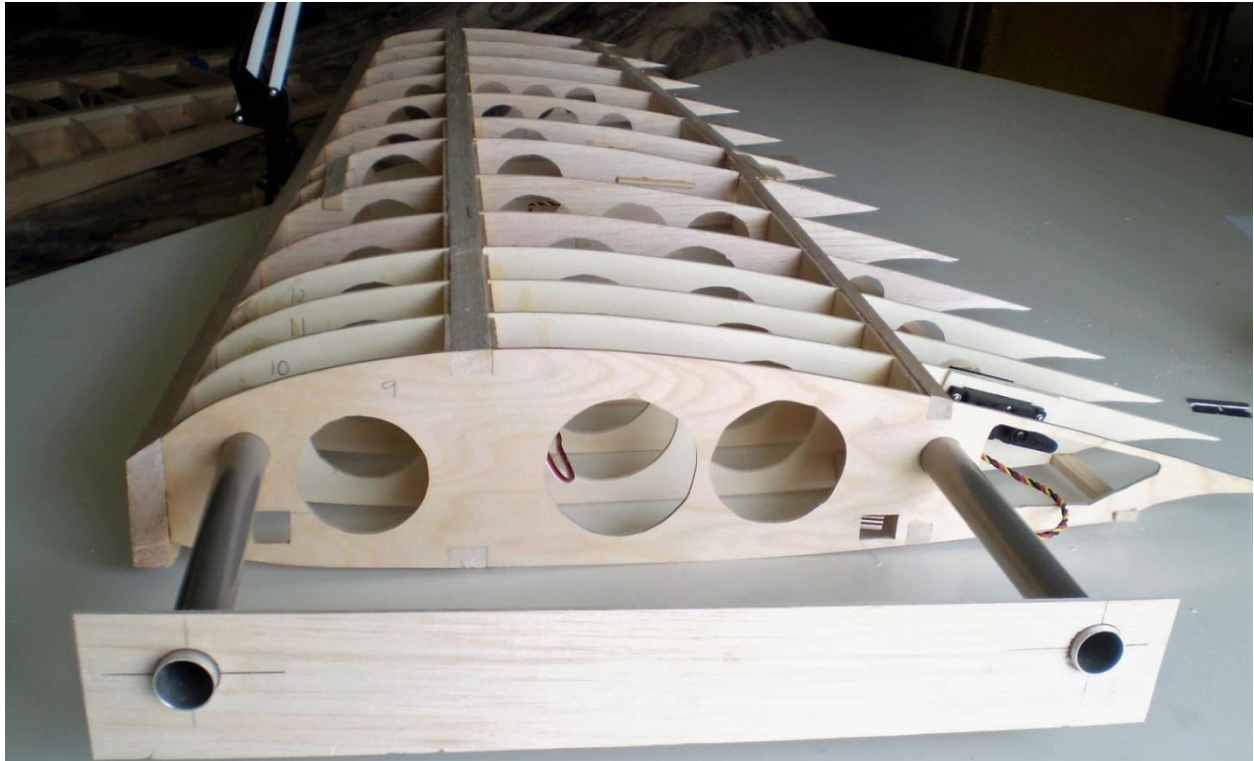# Drawing Wing Ribs With DesignCAD

--by David P Andersen

A giant scale airplane can have as many as two dozen rib sizes. It is possible to draw each of these ribs manually but that method is not very accurate. The process needs to be precise for the wing sheeting to mate well with the ribs. A quicker and more accurate method is to use CAD (Computer Aided Design) to draw at least the outline of each rib and the modeler manually draws the remaining details such as spar notches, lightening holes, servo mounts, etc..

To begin, draw the plan for the wing and measure the chord of the wing at each rib location. Also draw a front view of the wing and measure the thickness of the wing at each rib location.

Download DesignCAD 2D 64-bit to your computer. You will also need a printer and scanner.

Trace the outline of the airfoil from the airplane's 3-views. Use translucent vellum paper and a fine-point pencil or pen. Use an ellipse drawing template to trace the leading edge and a French curve for the remainder of the airfoil. These tools are available at artist supply stores.

Scan the drawing on your computer forming a JPG file. Crop out unneeded space around the airfoil.

Open your DesignCAD program. Click on the "Create a new drawing" in the upper left. You may close the "Tip of the Day."
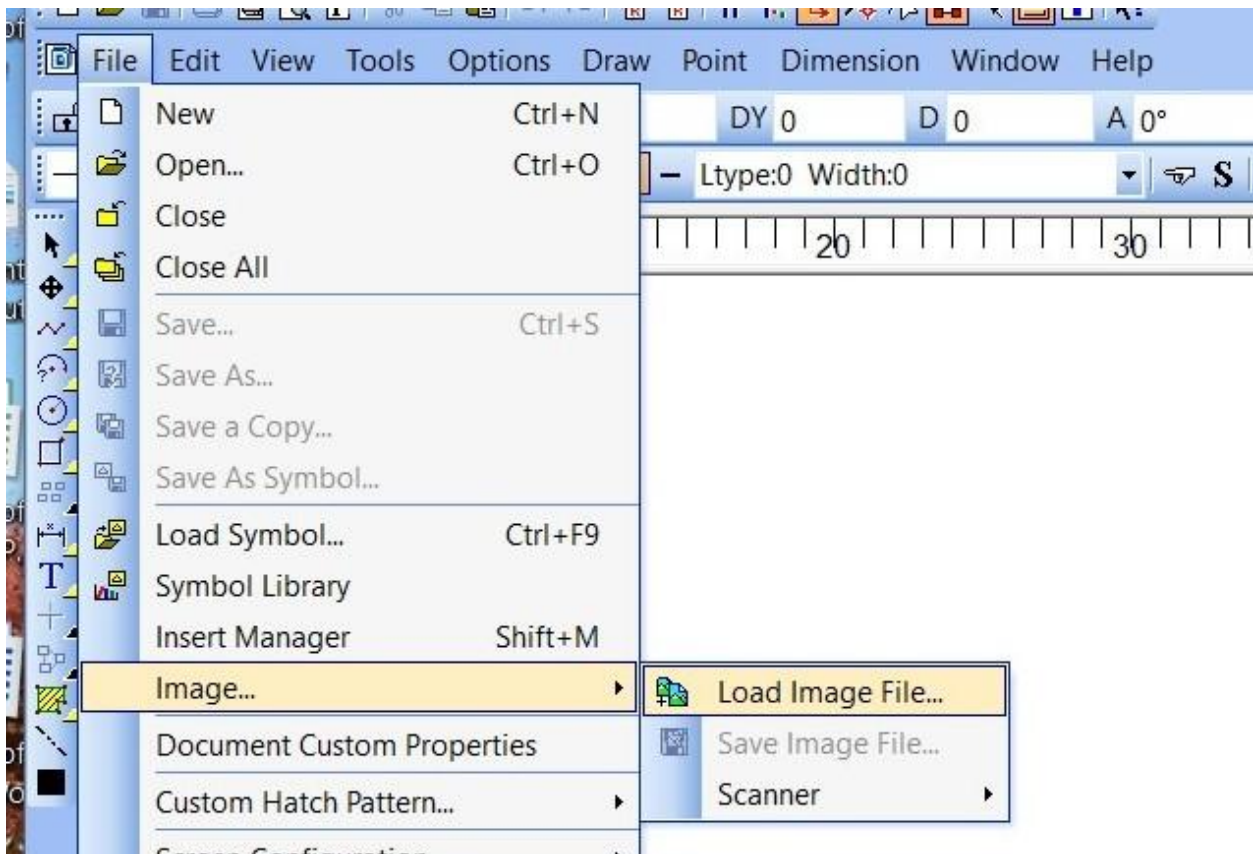
Move the cursor to the upper left and click on "File". Move the cursor down to "Image…" and right to click on "Load Image File…". Select the file containing the scanned airfoil JPG image and click on it.
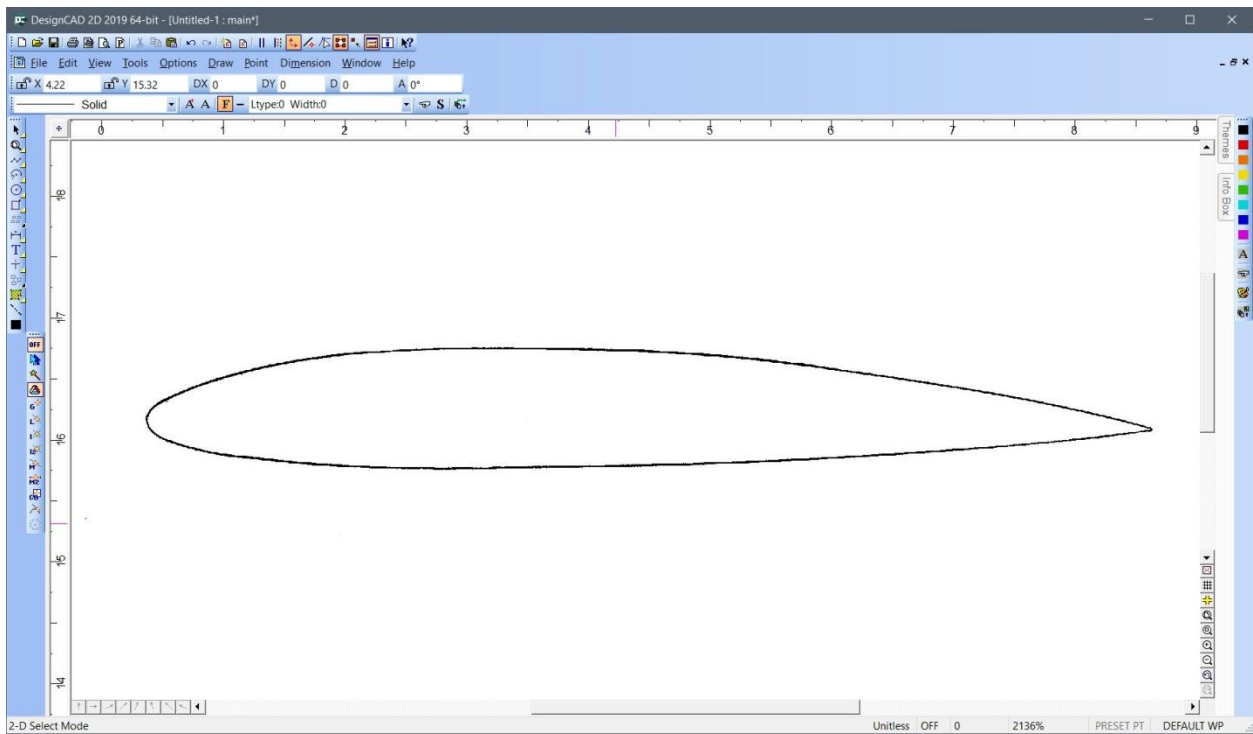
A big blue rectangle will appear on the screen. Click on it and your scanned airfoil image will appear in the screen.
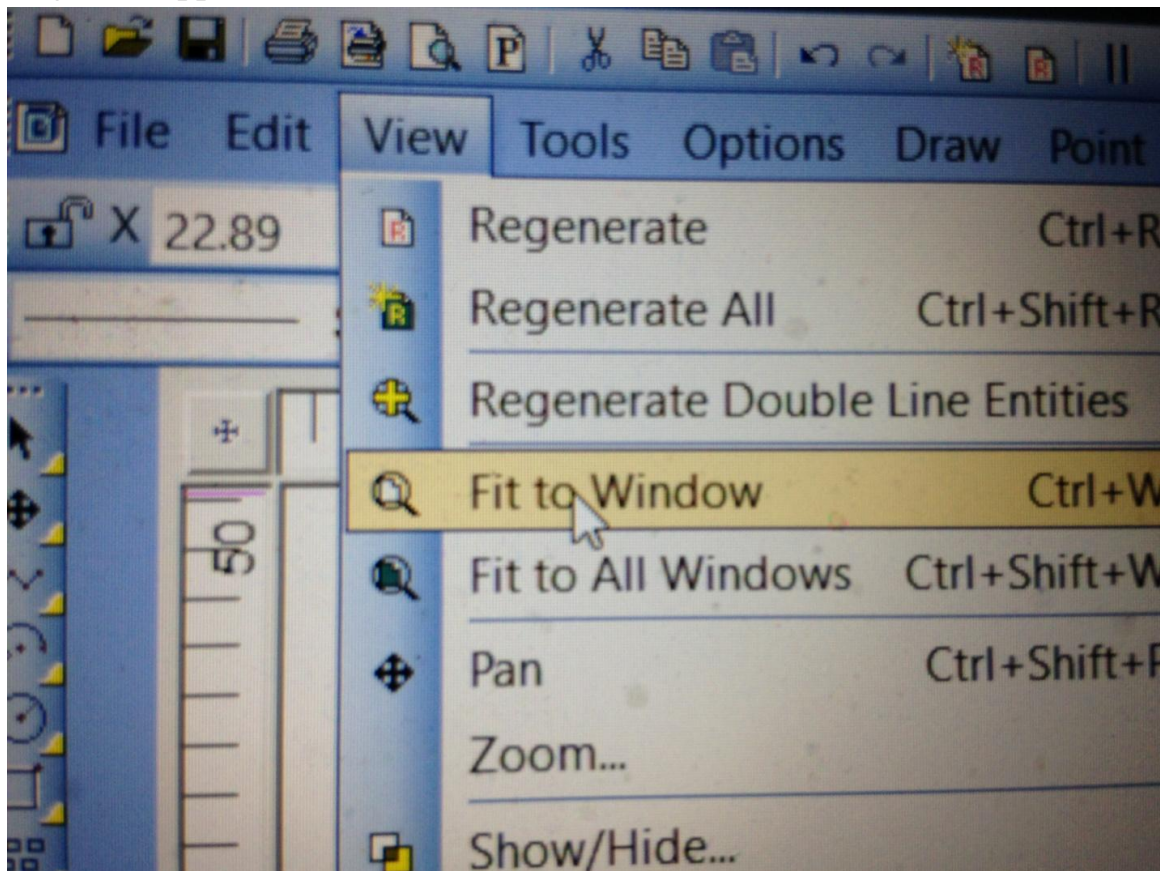

It may be too big for the screen and only part of it will appear.
If so, click on "View" at the top of the screen, scroll down and click on "Fit to Window".
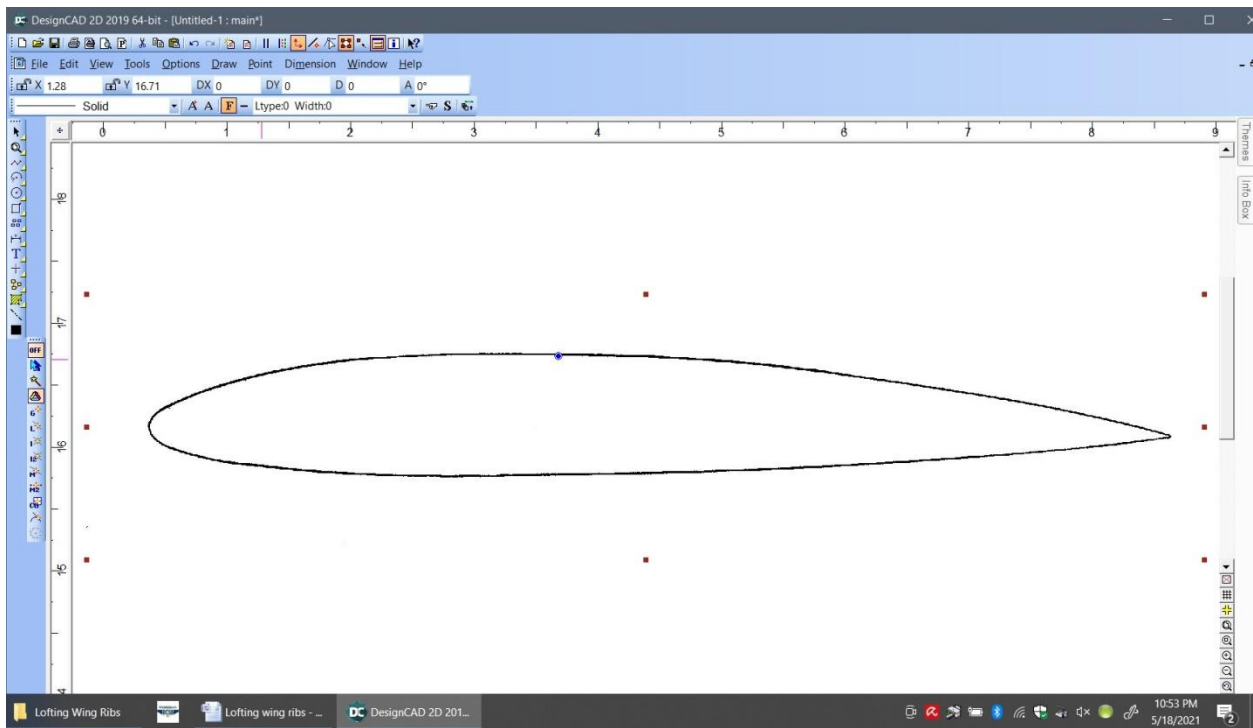
Eight "Handles" (little red squares) will appear at the top, bottom, left and right and corners of the image. If the handles are not there, click on the image and they will appear. The presence of handles says that the image has been selected for the next operation which is to convert the JPG image to a DesignCAD (.dcd) digital file .
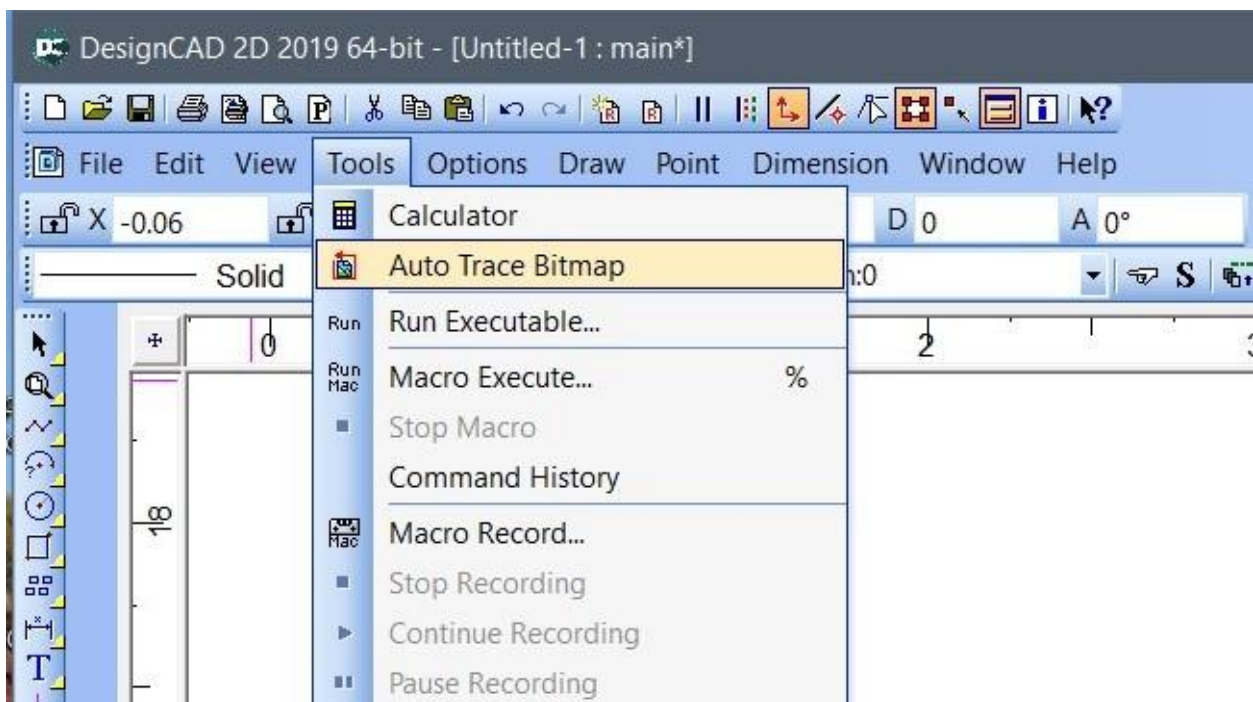
Click on "Tools" at the top of the screen, and move the cursor down and click on "Auto Trace Bitmap".
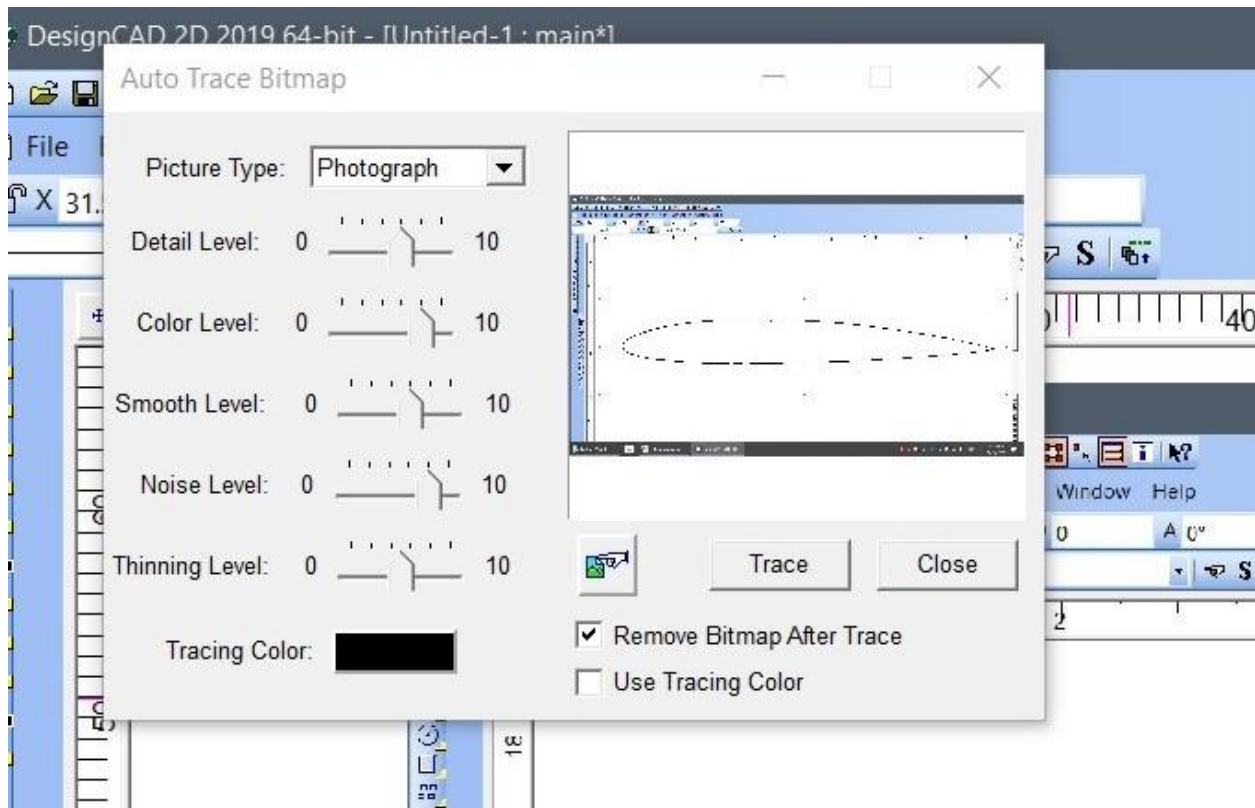
Click on "Remove Bitmap After Trace" and click on "Trace".
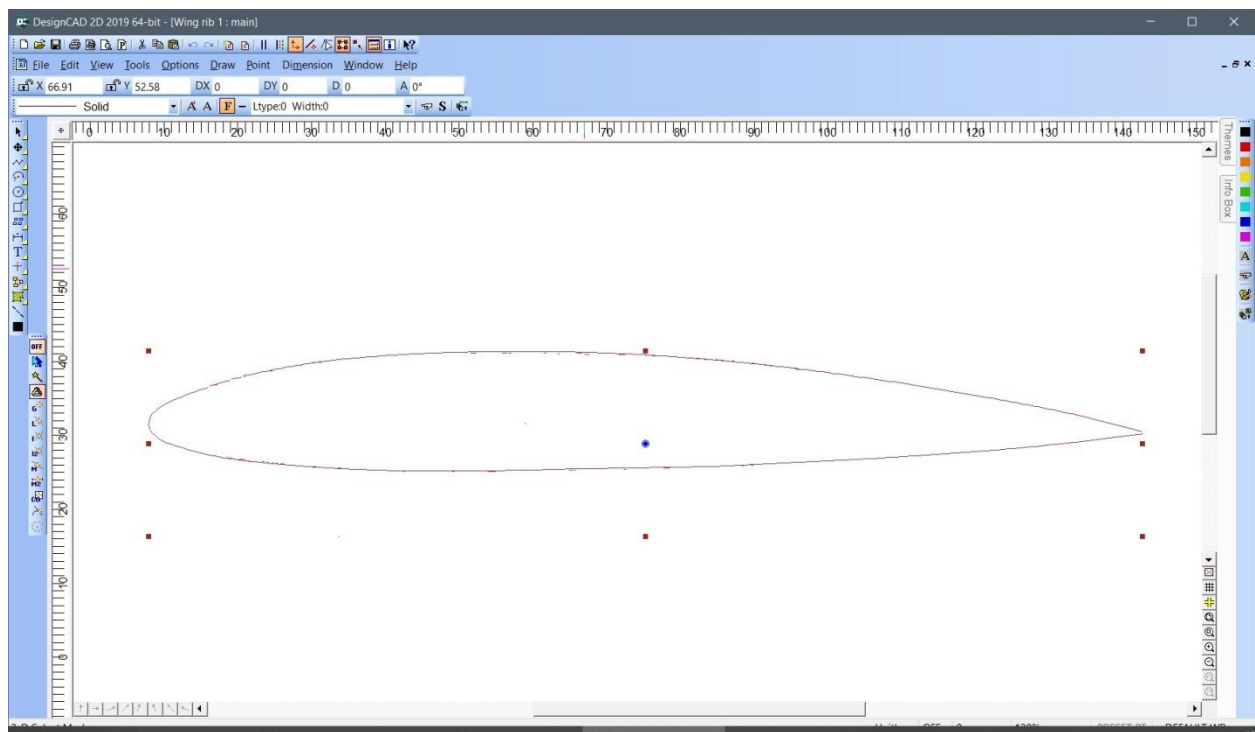
A new fine-line image of the airfoil will appear that is DesignCAD's representation of your airfoil. If you click on various parts of the image, changes

in color will show that it consists of several short line segments. Again, handles appear at the edges of the image.

Next, we wish to add dimensions to this image so that we can resize it.

Click outside the image to remove the handles. This will remove clutter we don't need right now.
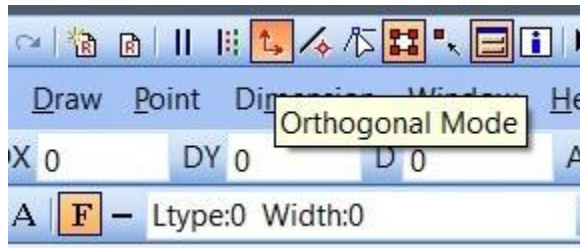
Click on the orange square with the two red arrows labeled "Orthogonal Mode". This causes all lines that we draw to be either horizontal or vertical—what we need for drawing dimensions.
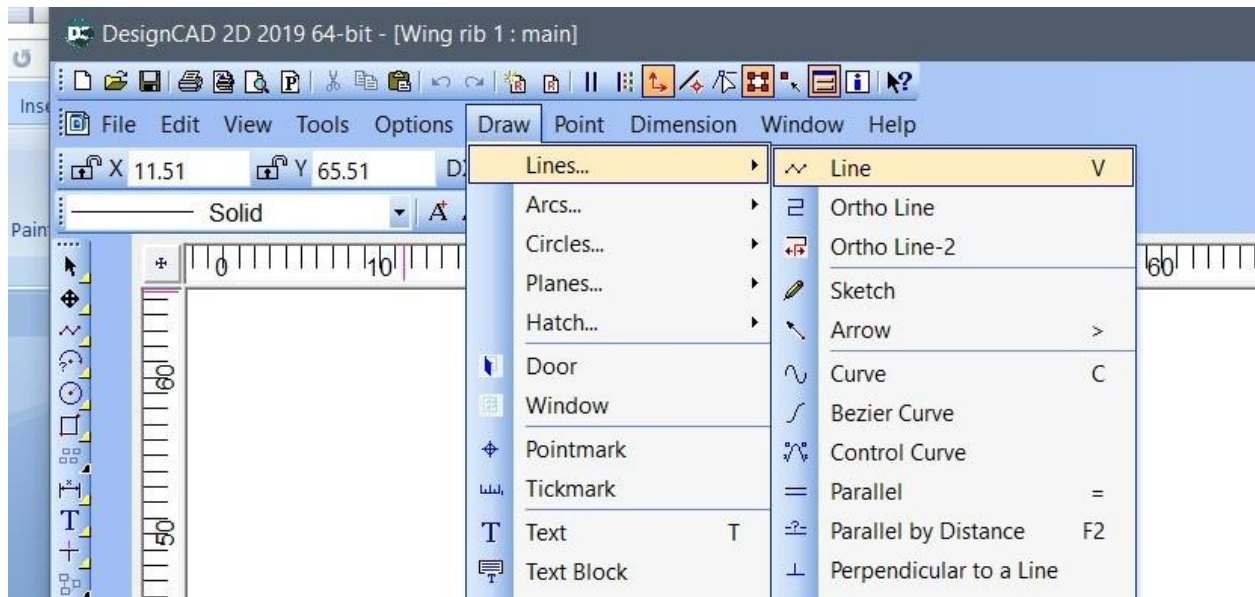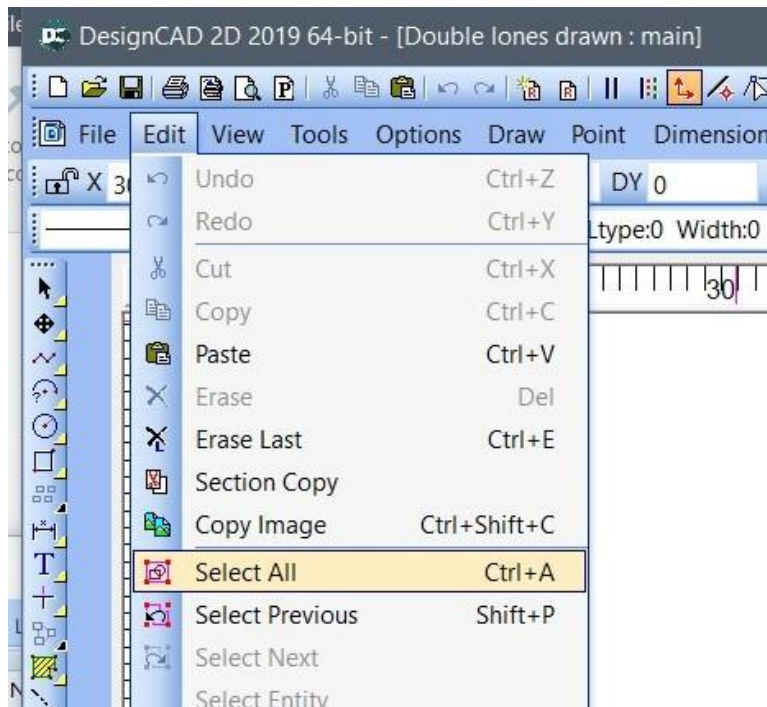

Click on "Draw" and scroll down to "Lines…" and right to click on "Line". This will allow us to draw a vertical line.
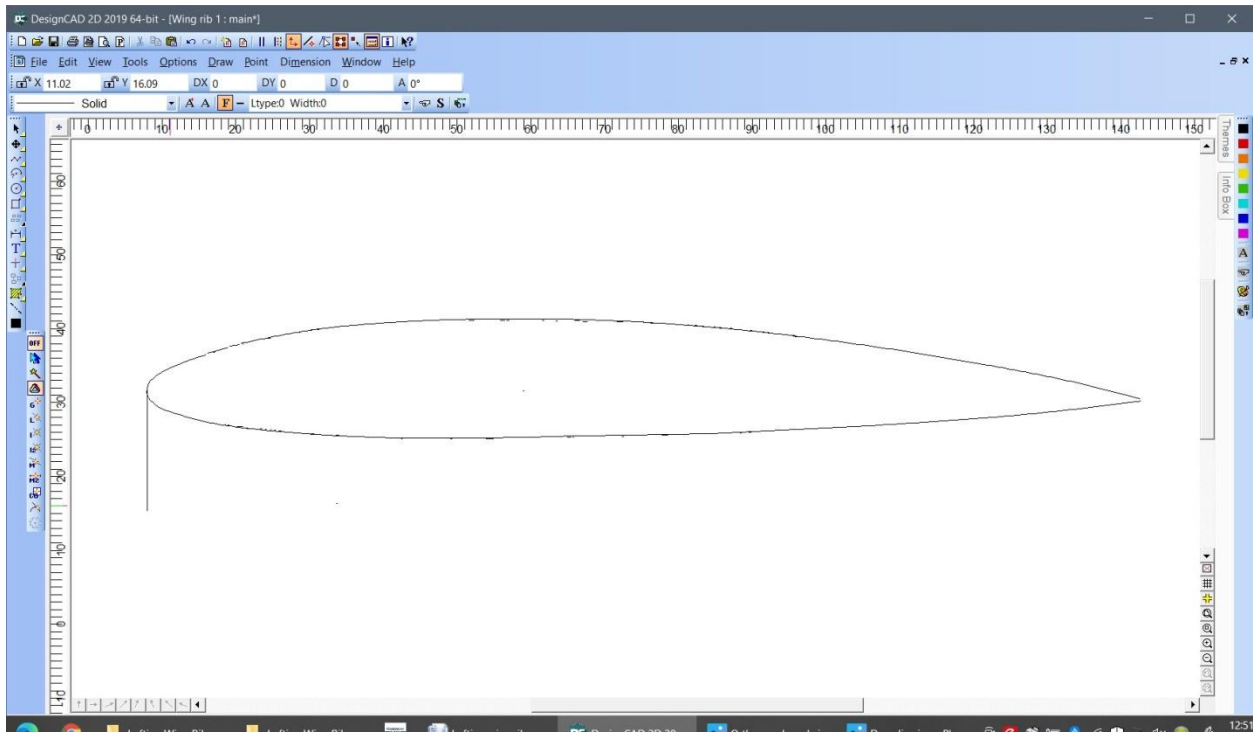
Move the cursor to the tip of the leading edge and click once. Move the cursor down below the airfoil and double click. This draws a vertical line at the leading edge.
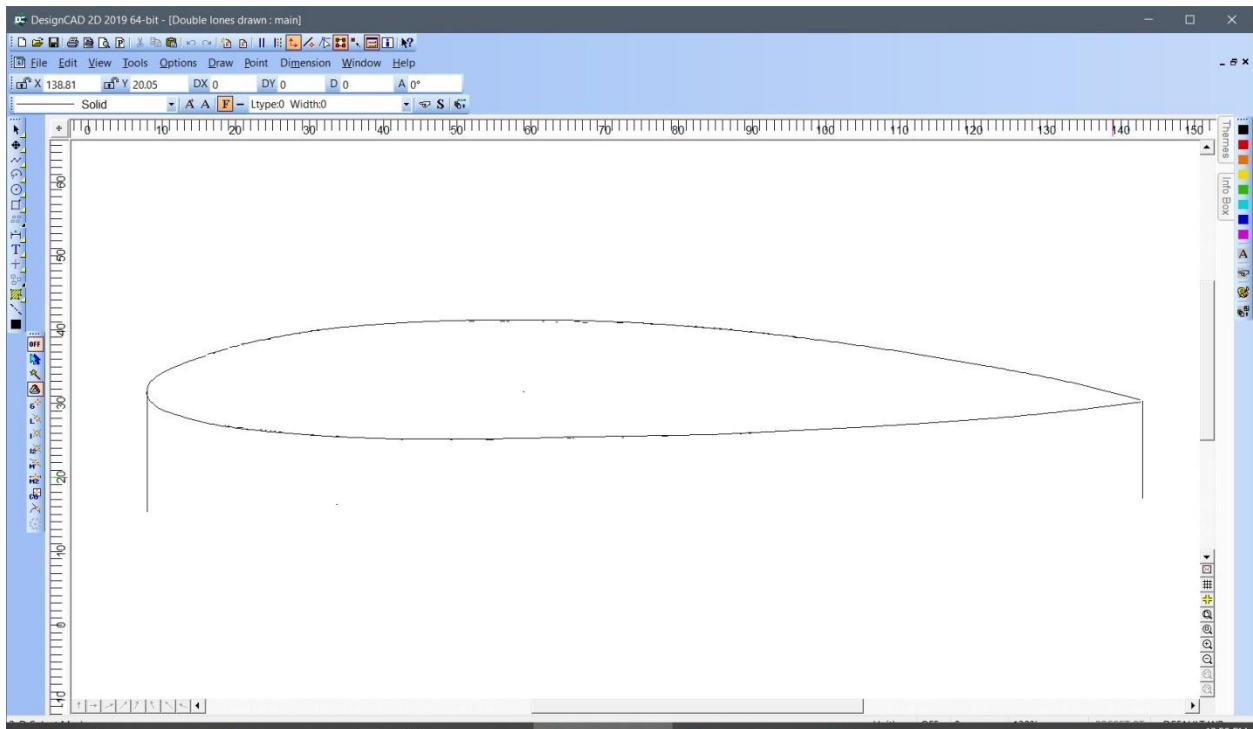

Do the same for the trailing edge. We now have vertical lines at both the leading and trailing edges.

Click on "Edit", scroll down and click on "Select All". This collects all the lines in the drawing into one object so that it can be operated on as a whole.
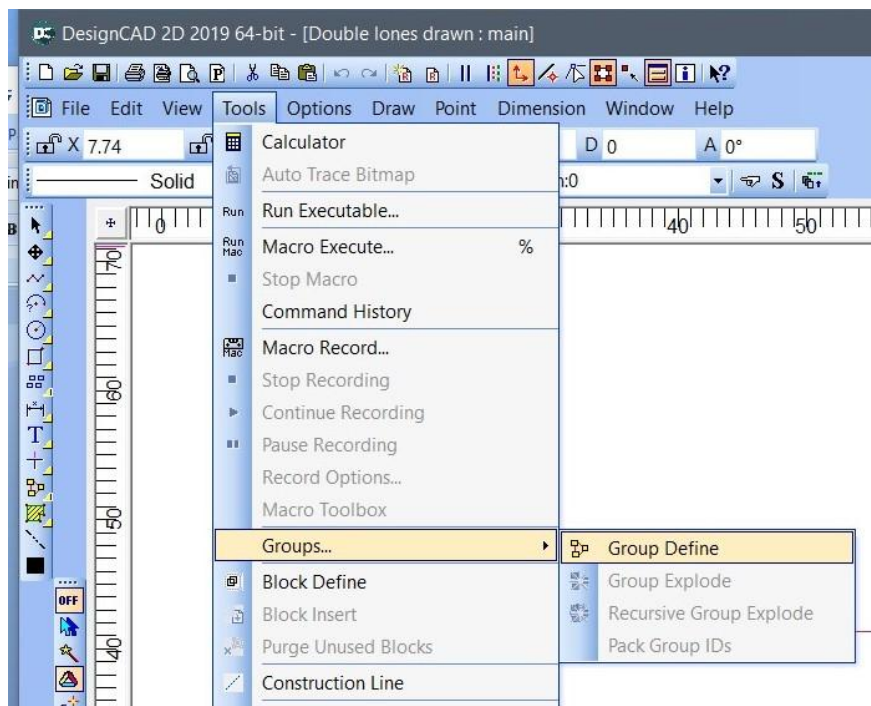

Click on "Tools" , scroll down to "Groups" and click on "Group Define".
This defines all as a single object so that we can move resize it.
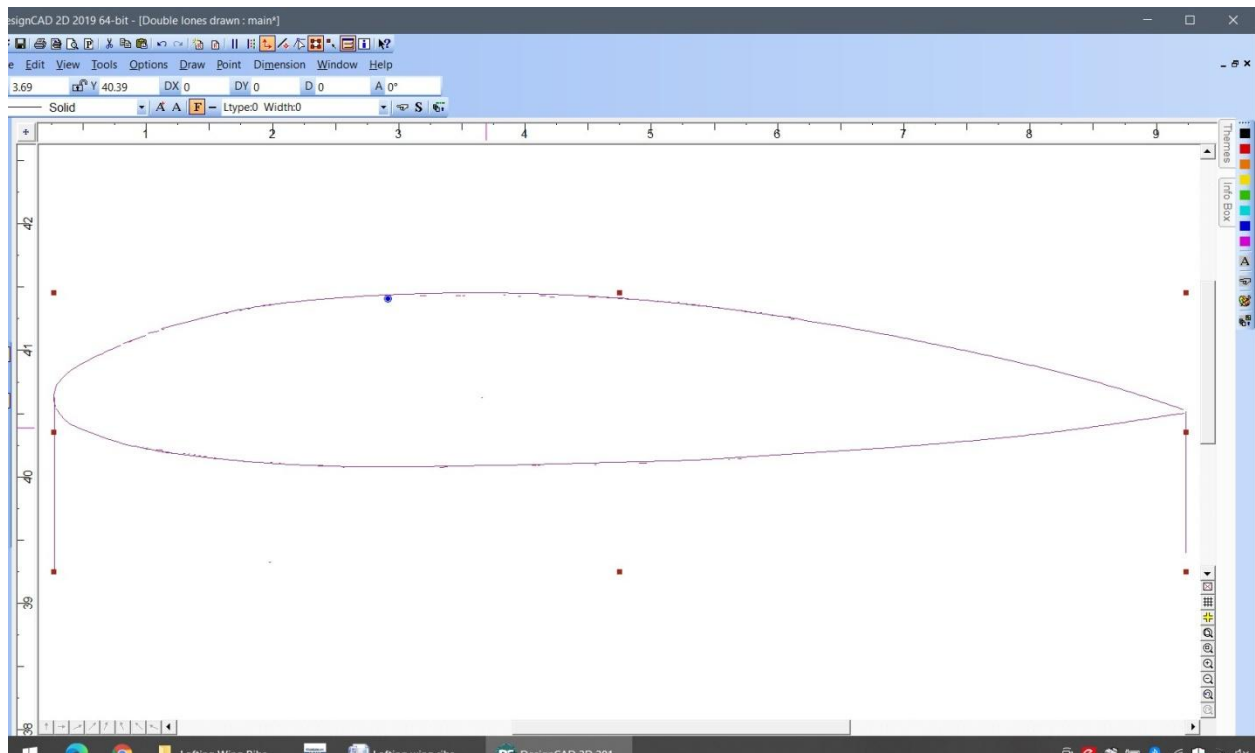
Click and drag one of the handles to reduce the size to approximately one of the rib sizes using the rulers above and on the left as a guide. We do this now so that the font size of numbers will be appropriate.
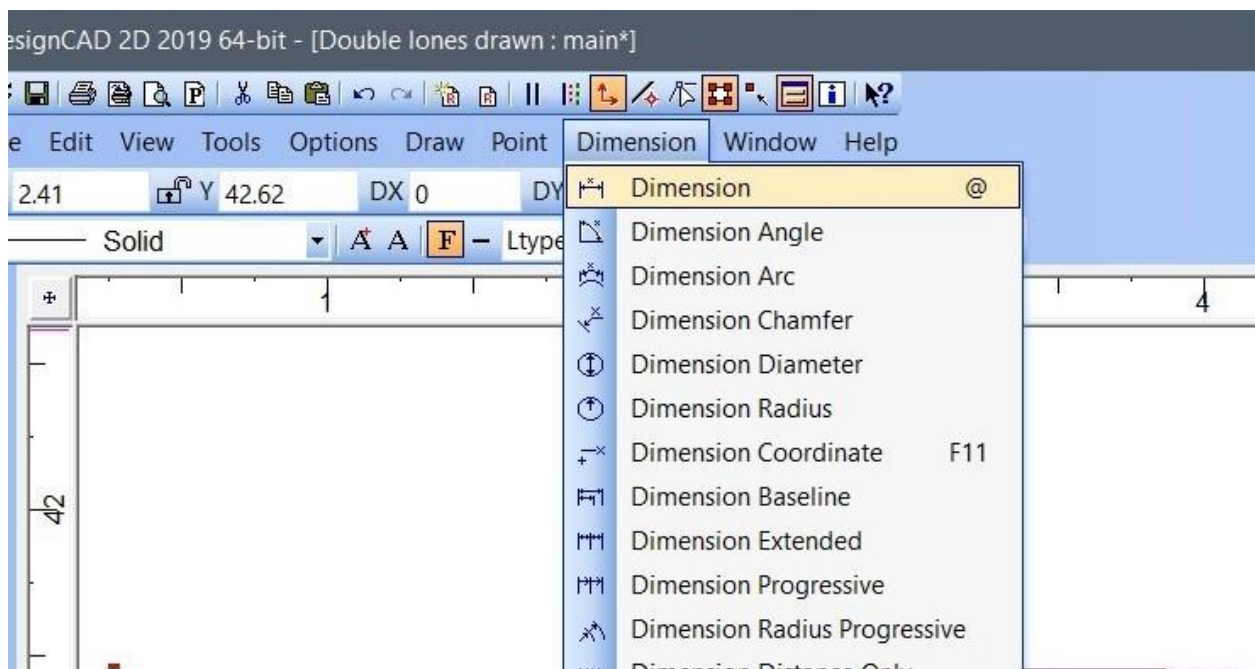

Click on "Dimension" in the command row above and click again on the "Dimension" that is the top item in the resulting list.
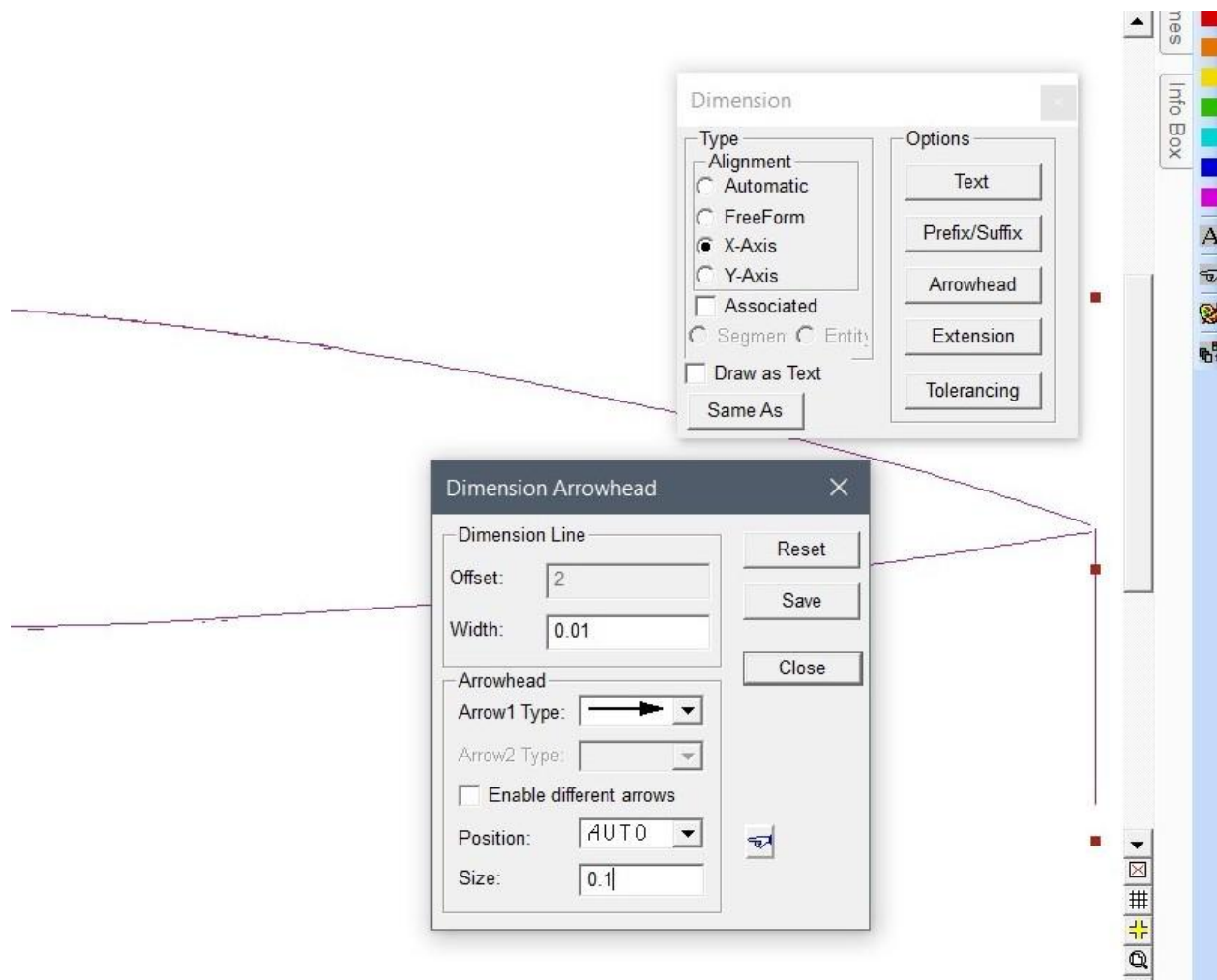
The "Dimension" window will appear. Click on "X-Axis". Click on "Text" and select a text size. (0.1 is a good choice).   Then click on "Arrowhead" and enter 0.1 in the "Size" field and click on Save and Close.
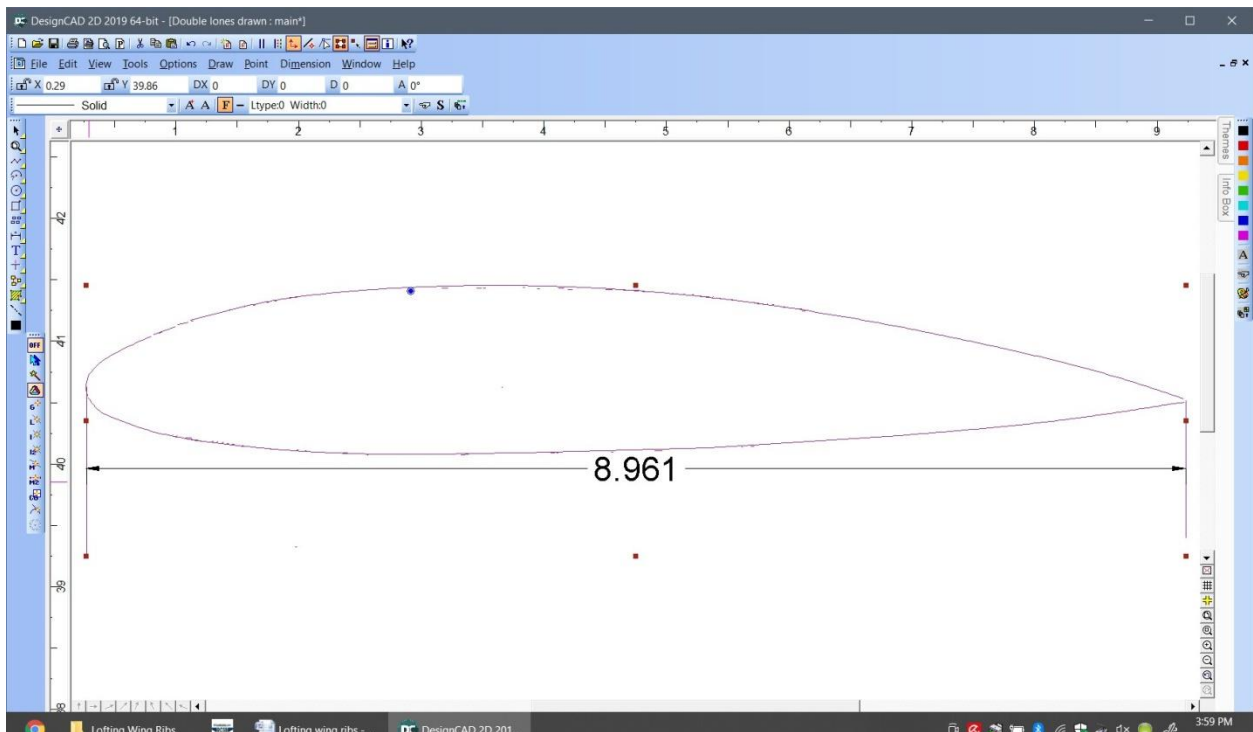
Move the cursor to the left vertical line and click once. Move the cursor to the right vertical line and double click. A horizontal dimension line with arrowheads will appear with the distance between the vertical lines displayed.
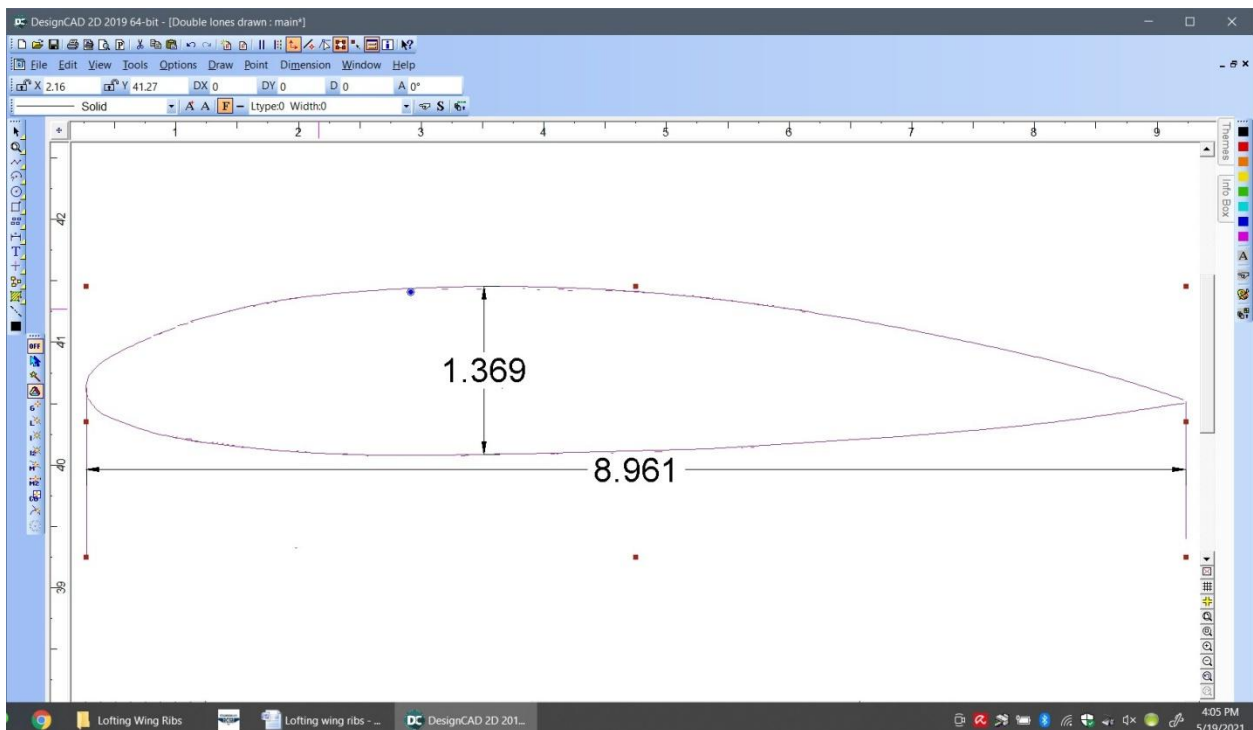
Repeat the Dimension operation but select "Y axis". Click on the highest point on the airfoil and double click on the bottom of the airfoil. The height of the airfoil will appear.
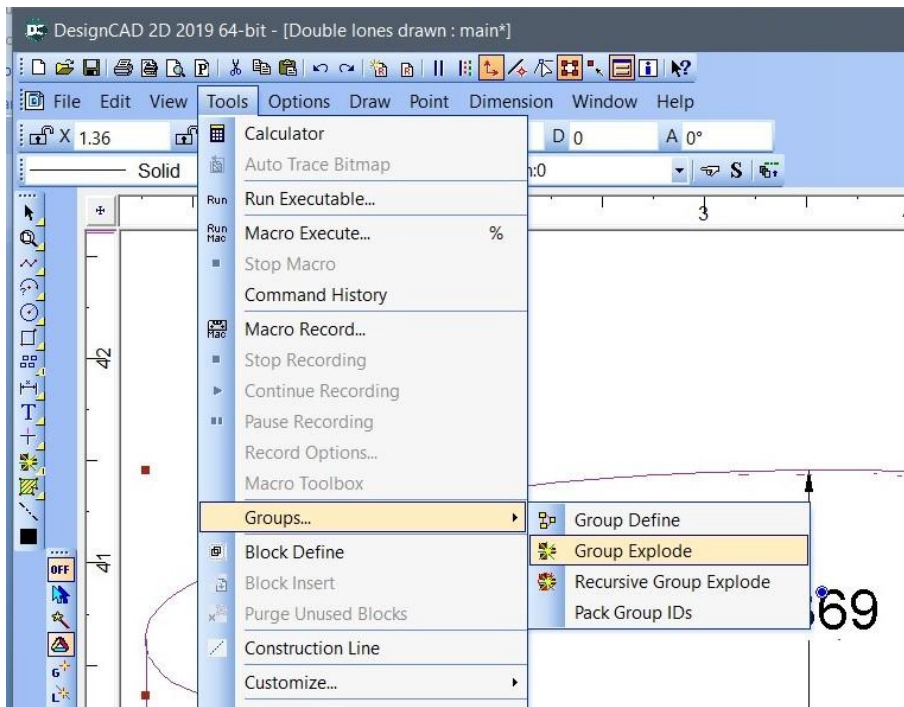
Click on "Tools" , scroll down and click on "Group Explode". This breaks the drawing into separate pieces so that we can redefine the group. Click on "Edit" and click on "Select All" to combine all segments of the drawing. This allows us to "drag and drop" the handles to change the chord and height of the airfoil.
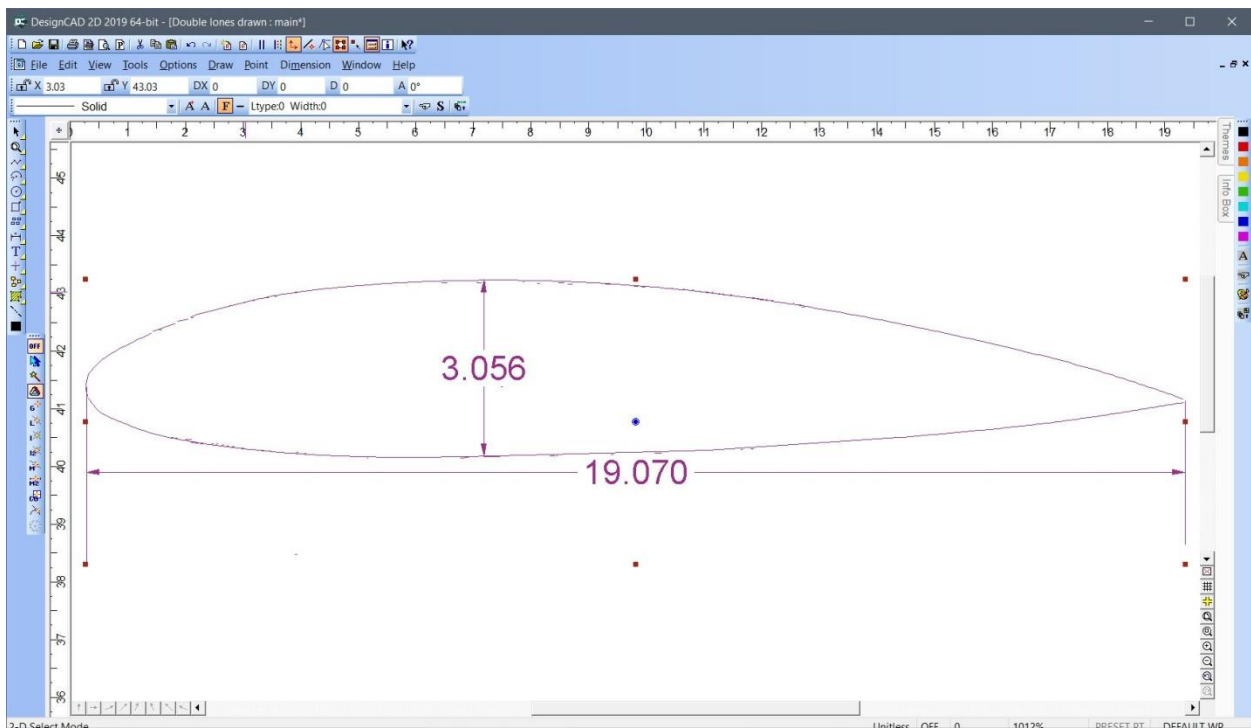

Click and hold on one of the side handles and move it left or right to change the chord of the airfoil. Notice how the numbers change as you move the handle. Likewise, click and drag one of the vertical handles to change the height of the

airfoil per your list of chords and thicknesses derived from the model's wing plans. It might be necessary to click on "View" and "Fit to Window" if the result is too big or too small for the window. It might also be necessary to zoom in on part of the drawing in order to make tiny movements of the handles. If so, click on "View" and click on "Zoom".
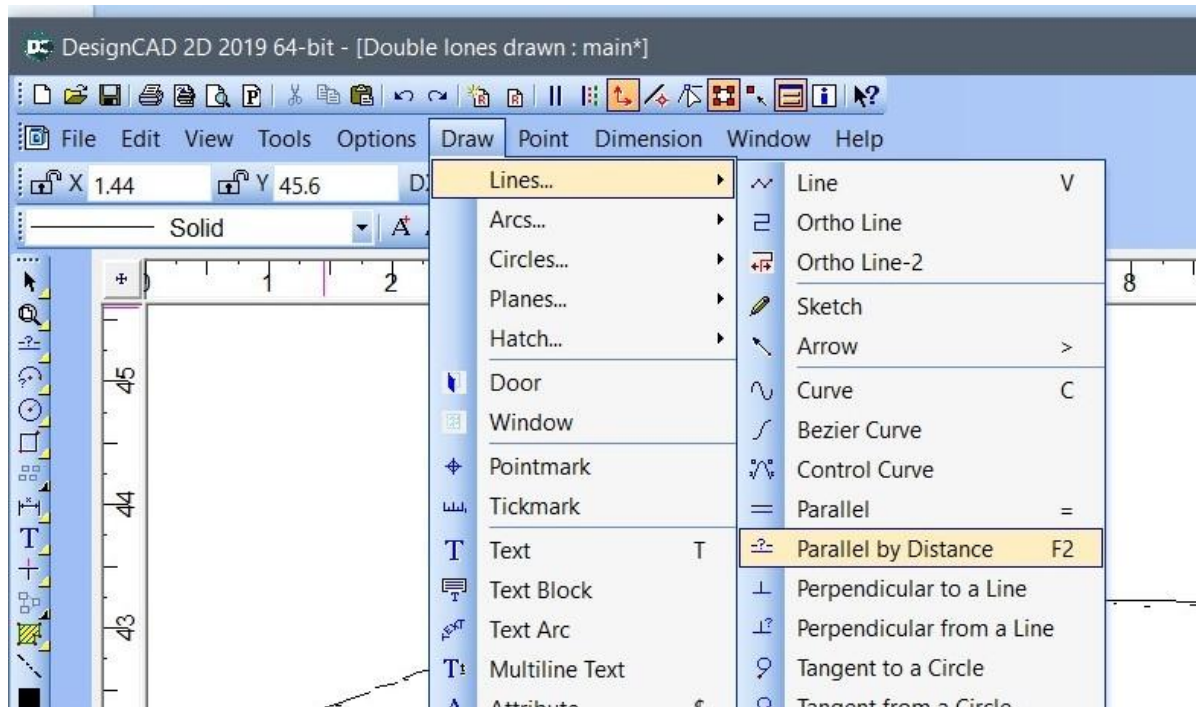

Next, we draw an inside line parallel to the airfoil that is the thickness of the wing sheeting, e.g. 3/32" =0.09375". Click on "Draw", over to "Line" and down to click on"Parallel by Distance".
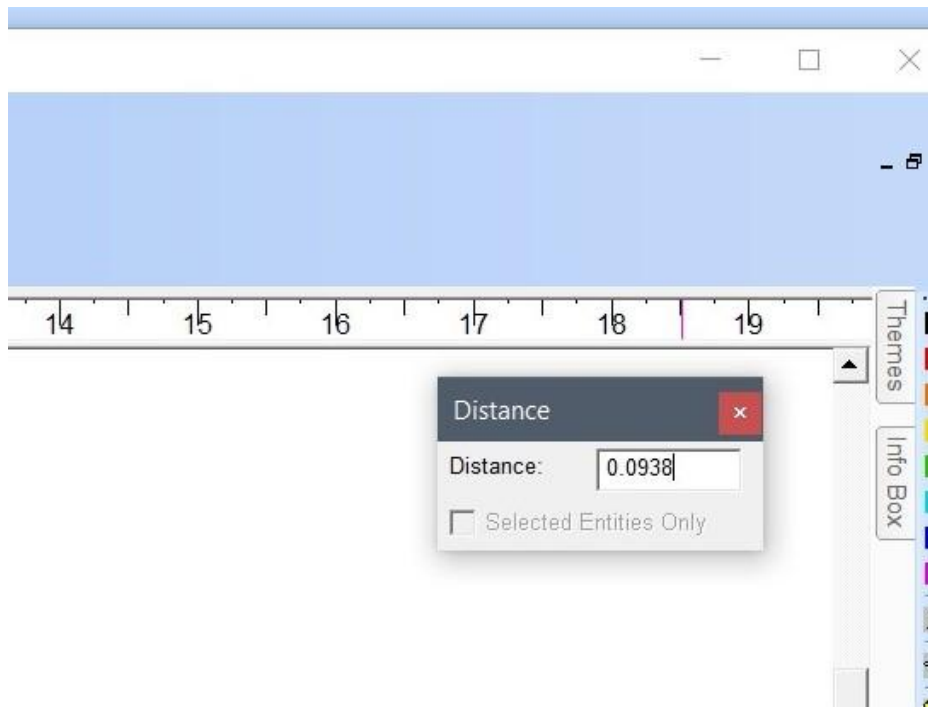
Enter the wing sheeting thickness in inches, e.g., 0.09375. Click on the line.
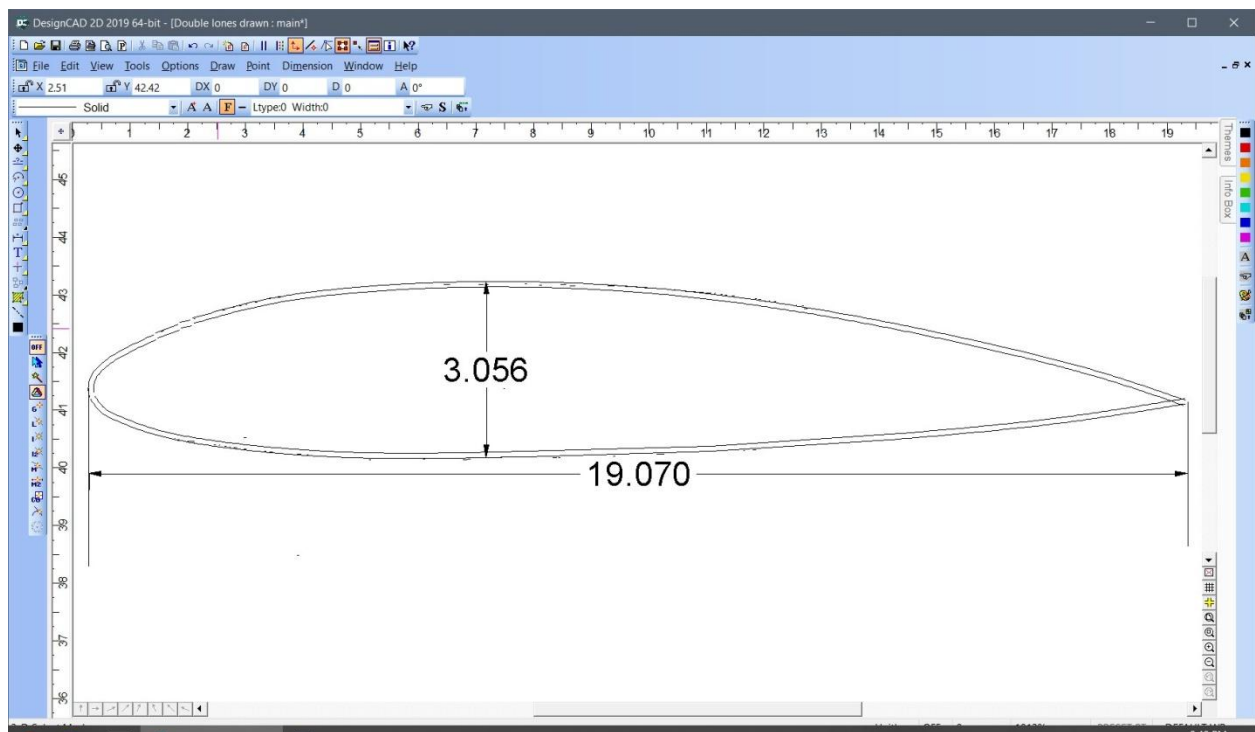
A parallel line will appear. If you move the cursor outside the line a parallel line will appear outside the line. If you move the cursor inside the line the parallel line will move inside the line. Move it inside and click. A parallel line will be drawn inside the airfoil line. The airfoil consists of several connected lines, so you must repeat this process all around the airfoil.
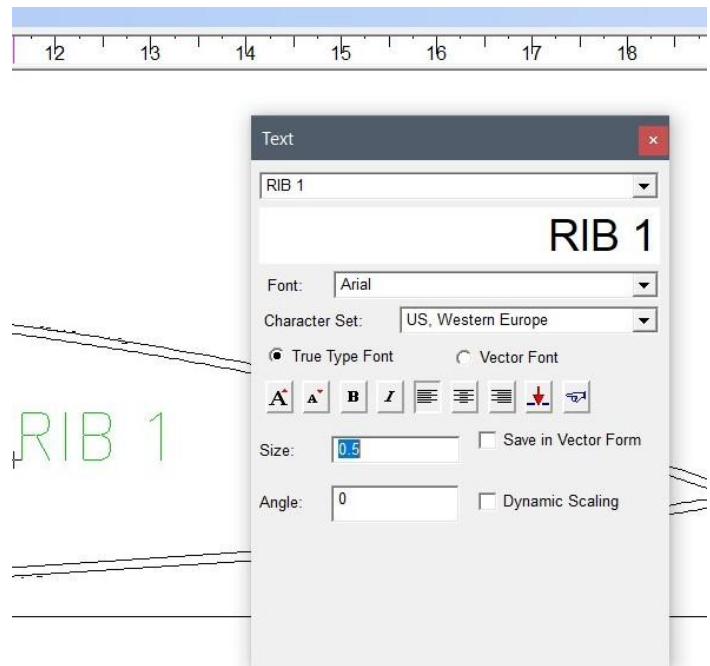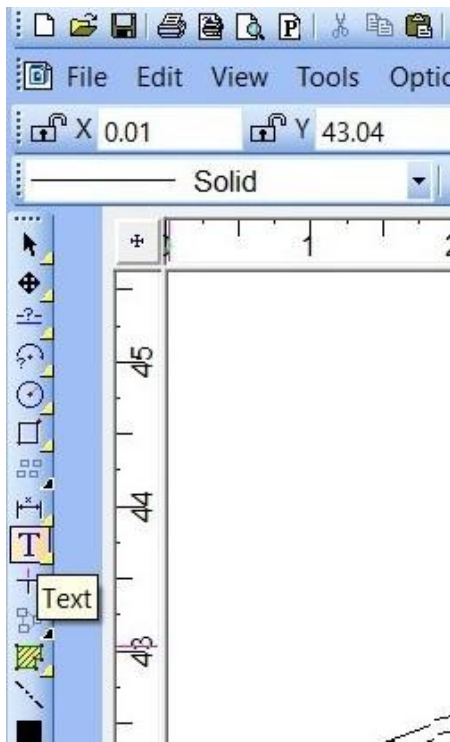
Lets add a title to the drawing. Click on the T (for TEXT) on the left side of the screen. A "Text" window will appear. Enter the text, e.g., "RIB1" and the text "Size" e.g., 0.5. "RIB 1" will appear in the drawing as light characters. The cursor will appear on the text.
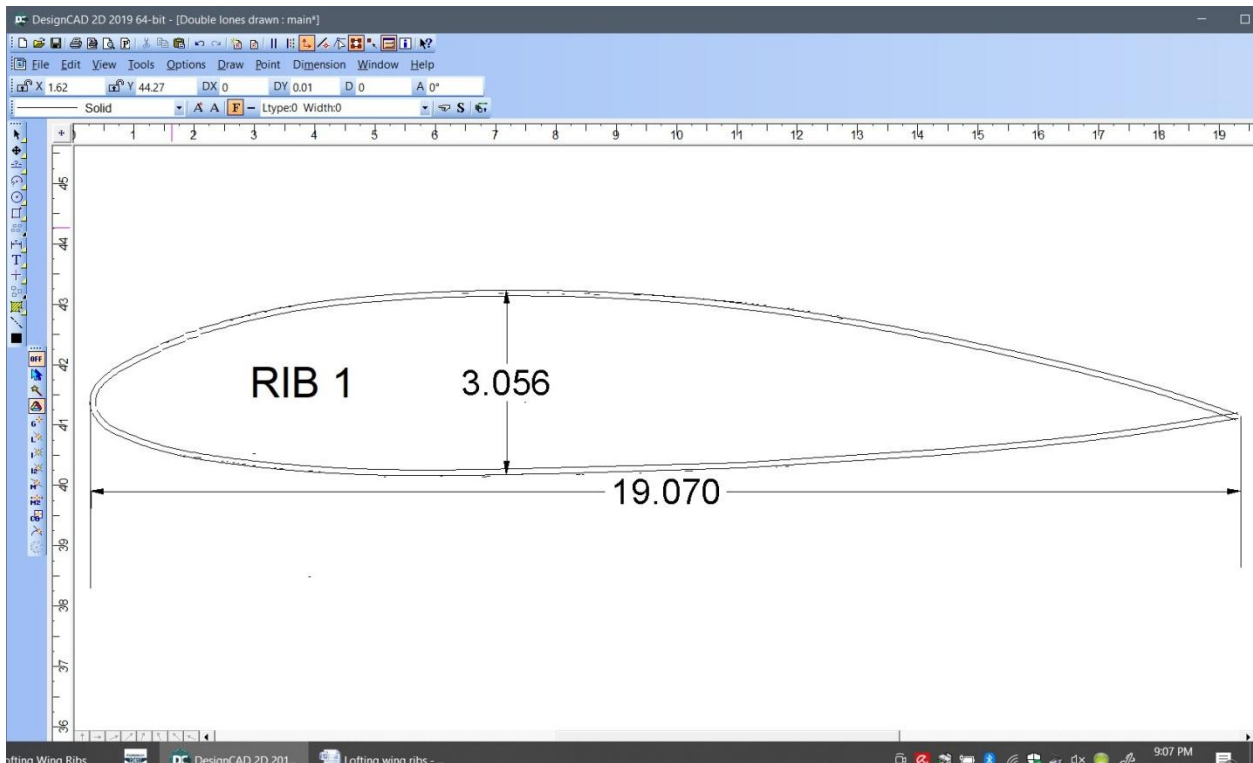

Move the cursor (and the text) to where you wish to have it displayed and double click. The text will be written as bolder print on the drawing. Save the drawing

("File"--Save As…") for later reference with the file name "Rib 1" or something similar.
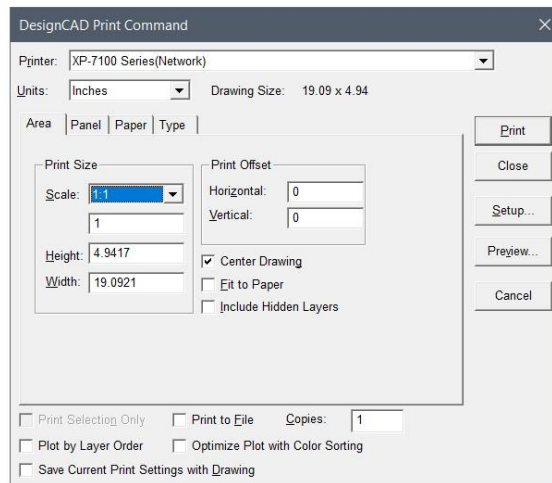

It's time to print the rib so we can add further details. Click on "File" again and scroll about 2/3rds down and click on "Print". Unclick "Fit to Paper". Set "Scale" to "Custom" and then to "1:1". This example is too big to print on one page so it must be printed two pages. So click on "Panel" and change "Mark" to "Corner Mark" and click on "Setup" to open another window to select your printer's paper size, typically letter size and click on "OK".
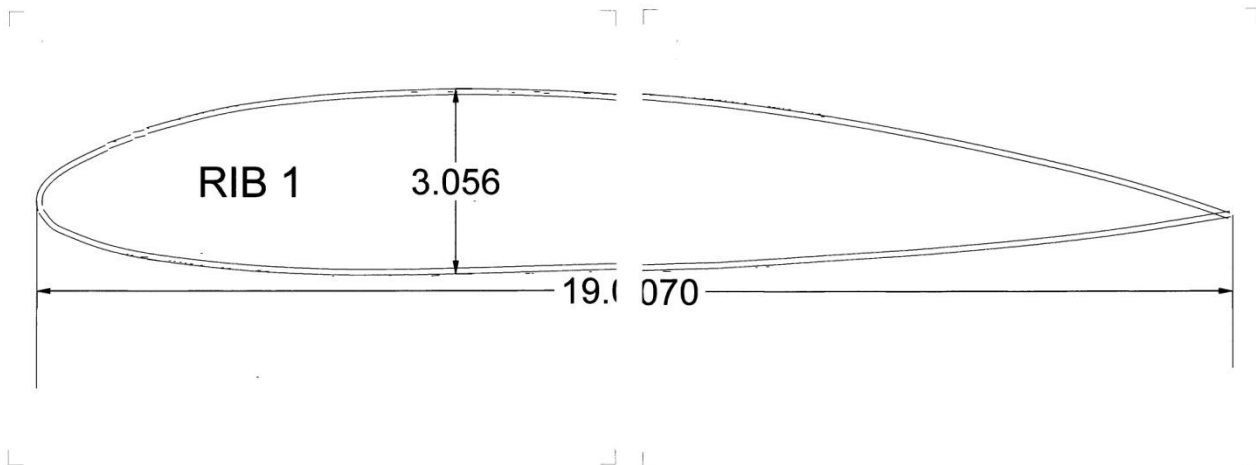
In this example, the Rib1 will be printed on two sheets. Each sheet will have a mark in each corner. Load your printer with vellum paper and print. Assemble the two sheets so that the corner marks align and tape the two sheets together.

Lay the drawing over the wing plans and mark the location of the leading edge spar, main spar, aileron hinge line, servo cable holes and other details. Then draw these in by hand.

To draw the next rib, erase the interior parallel line using the "Erase" command under "Edit". Erase the title "Rib1". Drag and drop the handles to a new chord and thickness. Redraw the parallel lines and add a new title.
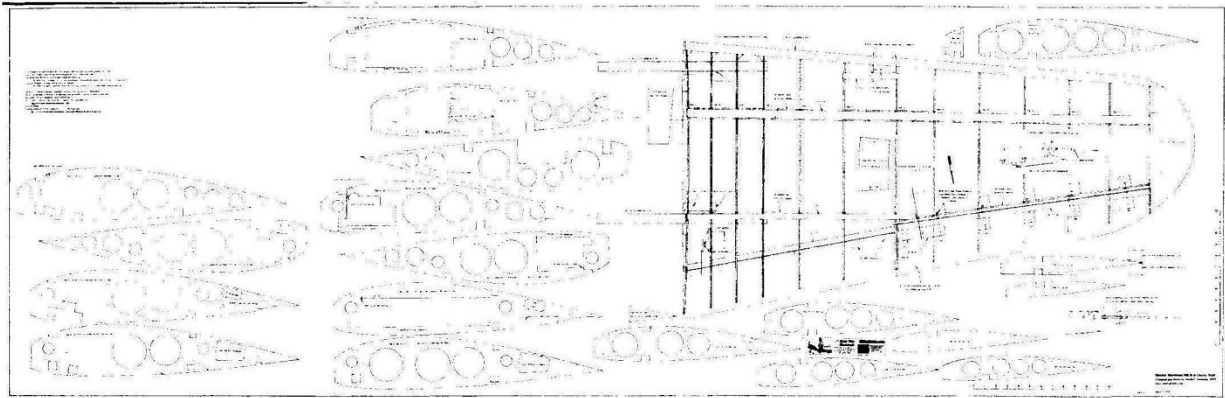
Add the ribs to the wing plans.

This technique can also be used for drawing horizontal and vertical stabilizer ribs. The method can also be adapted to lofting fuselage formers.

Consider using the rotate command (Edit—Selection Edit—Rotate) to twist ribs for washout.

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