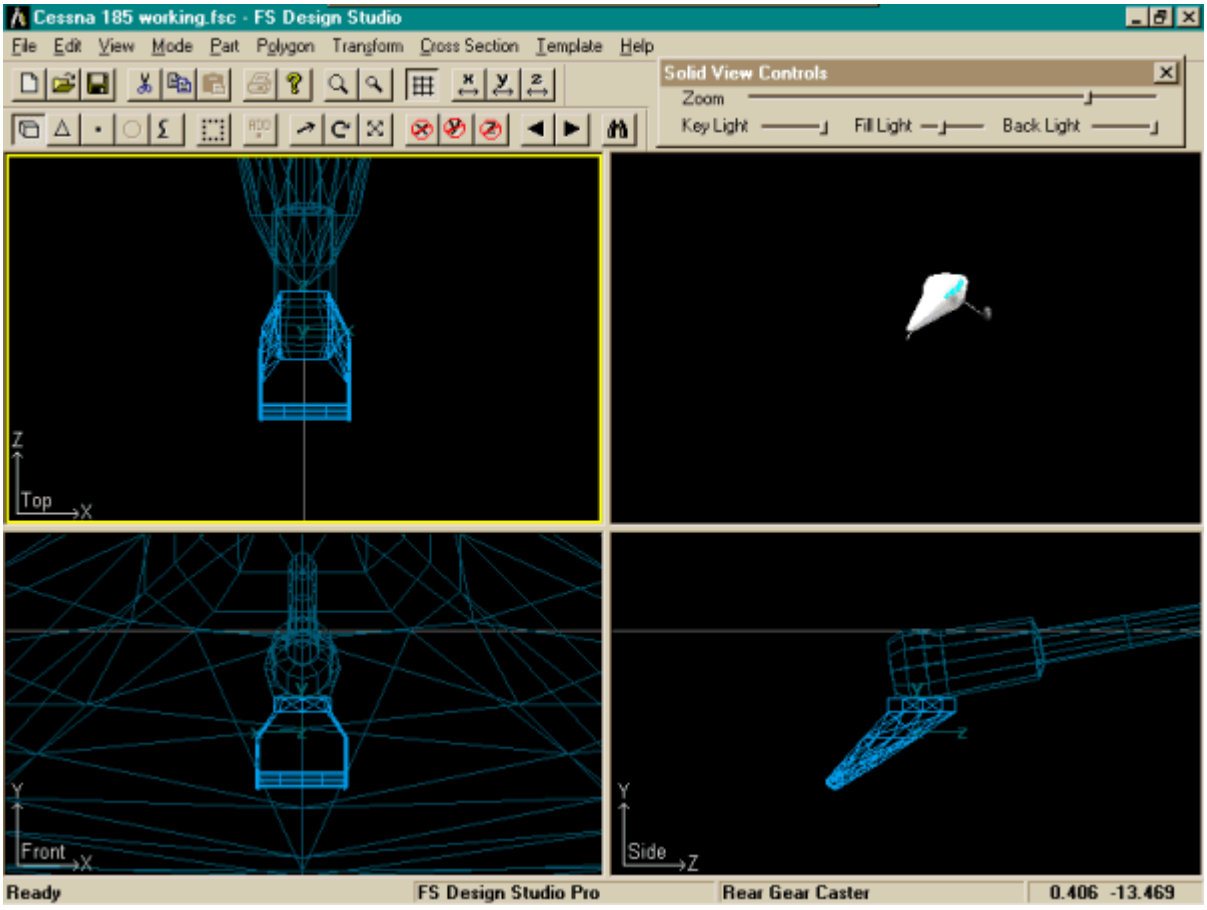
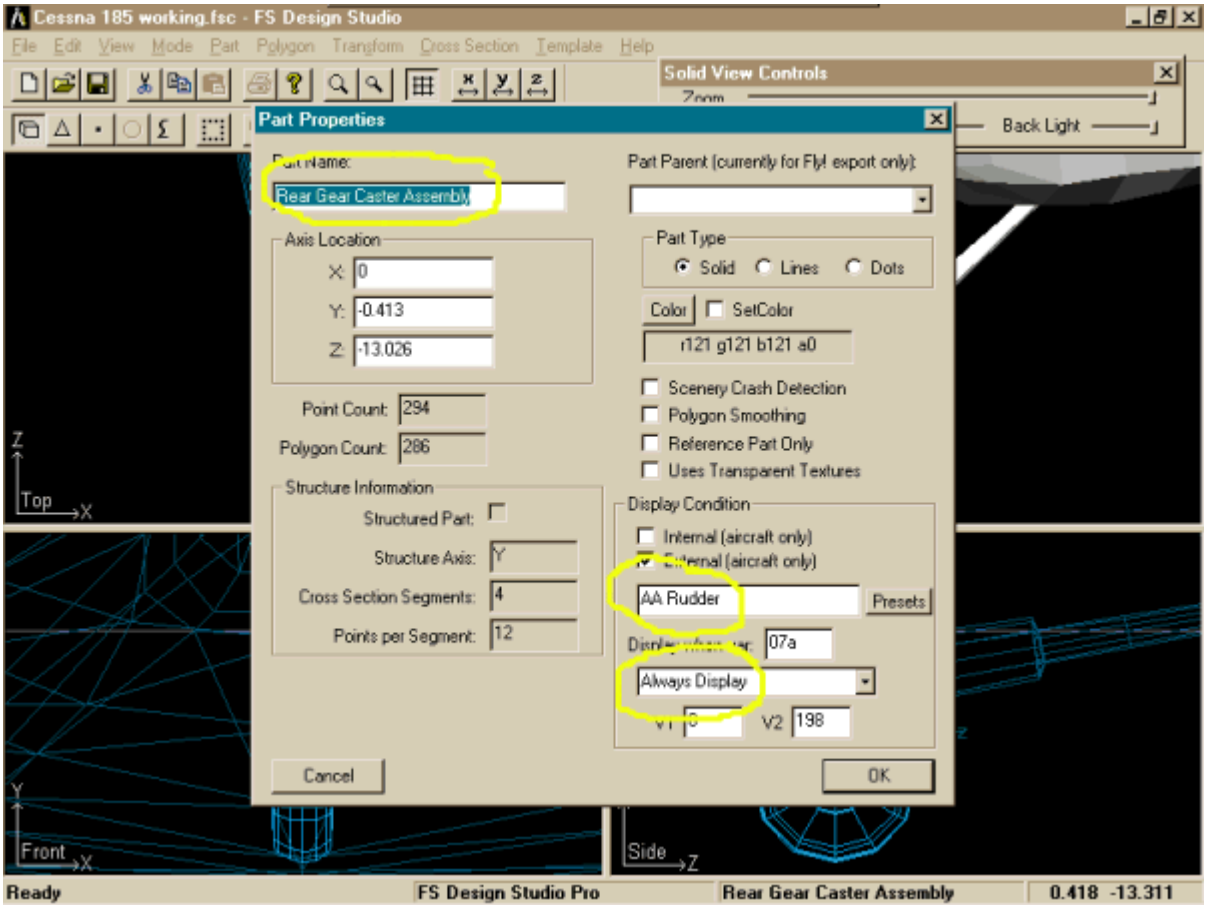
FS Design Studio

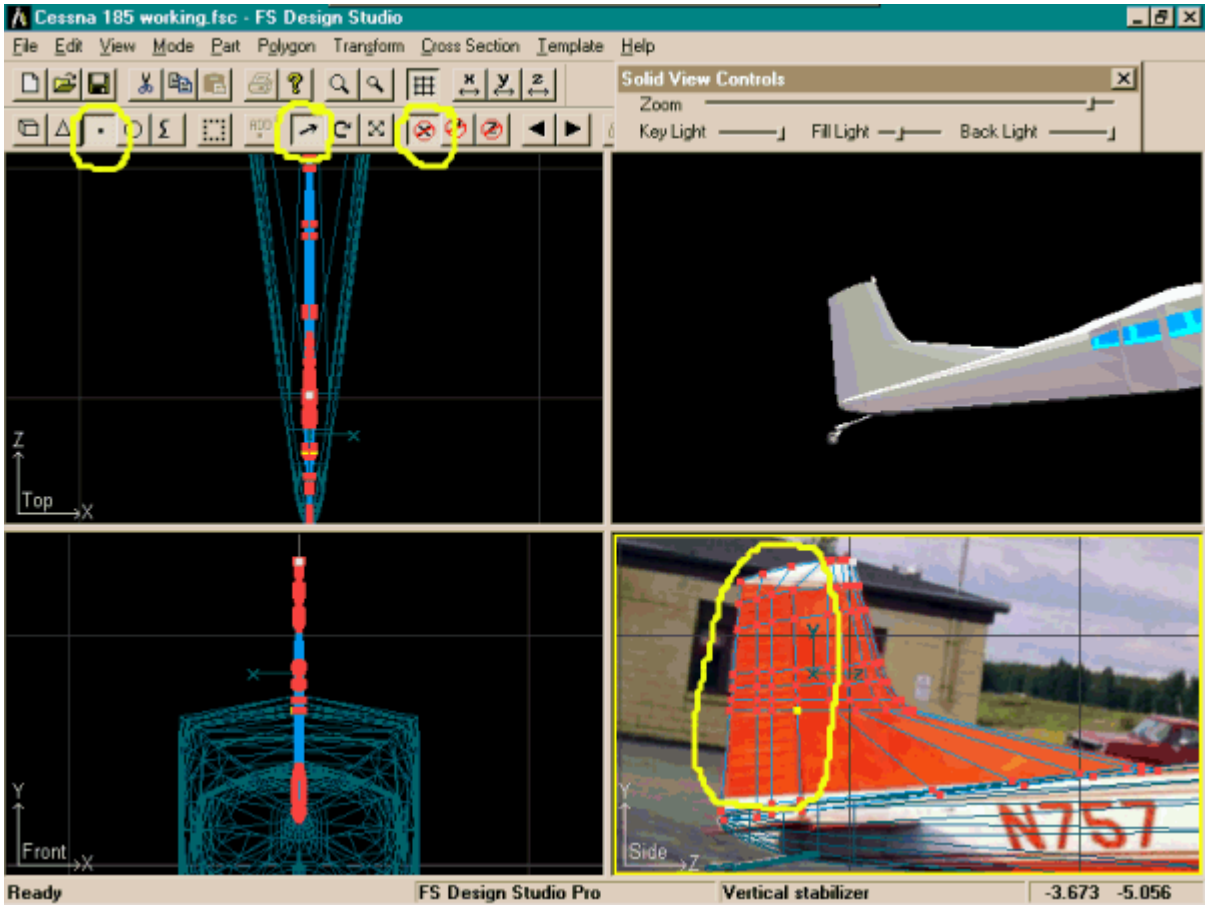
Making an Aircraft - Tutorial Part 3, by Ron Anderson

Did you notice that the tail wheel is a caster? The strut is fixed and the wheel is on a trailing fork assembly. We'll tag it as rudder to make it move. Just briefly, I made the strut from 2 tubes, the longer part that connects to the fuselage and the caster bearing portion. The caster part has a flat bottom and houses the bearing. The strut is also fixed. The only part that will turn is the caster itself. So I made a tube, split it by removing some of the center polygons at the lower end and then by selecting points I made polygons to close the forked portion and reshaped it to look like the backdrop picture. I added an axle, the wheel and tire to it. Then I joined the caster, wheel and tire into one assembly and saved it. Before saving right click on a view and select current item properties. Name it Rear Wheel Caster Assembly, open the presets menu and select AA rudder, then set always display. Now save the part as Rear Wheel Caster Assembly.

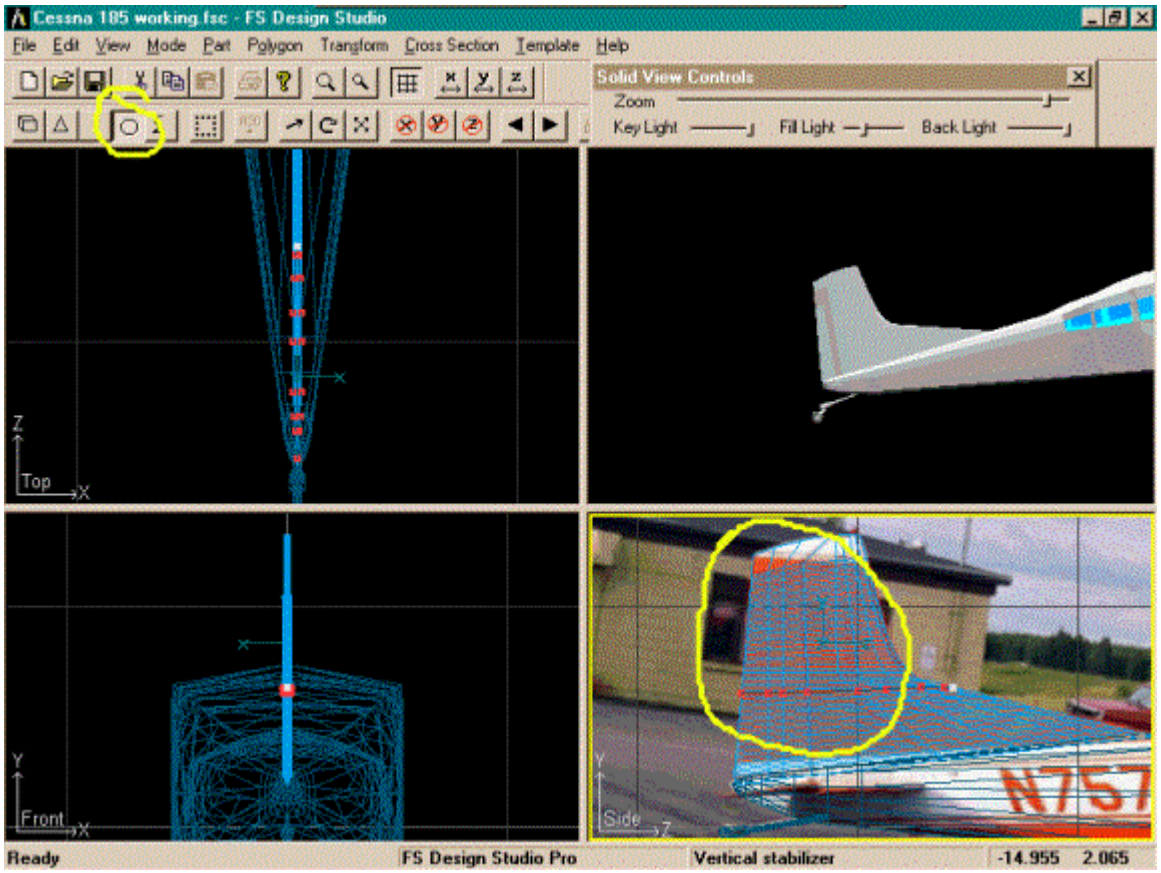




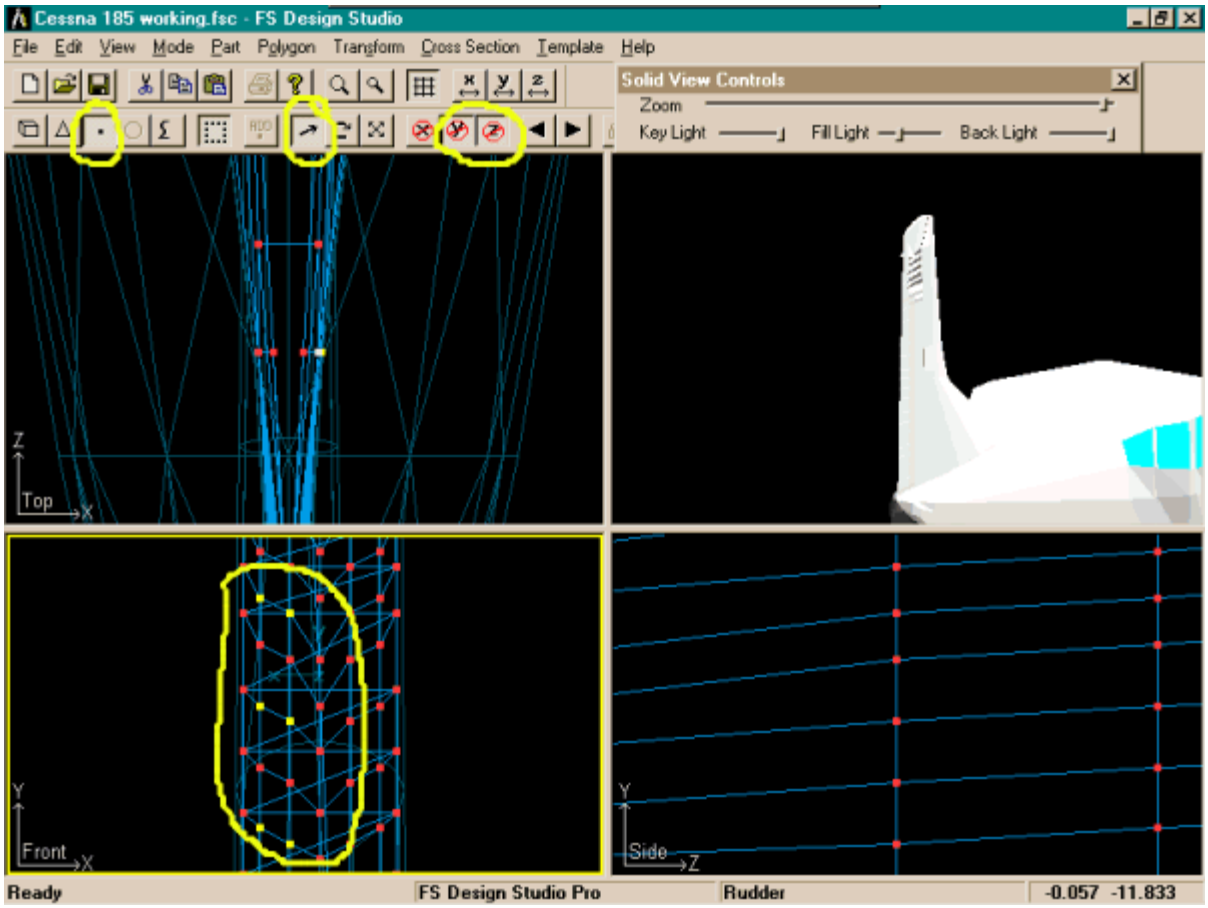
Now let's put some wings on this bird. We'll begin by making the vertical stabilizer and rudder. Many people like to use the Wing wizard for this but since a vertical stabilizer is symmetrical from left to right, I prefer to make it from a tube. So Select Part, Add tube. Now select Move mode, restrict the X axis and move the tube into position. Select Scale mode, restrict the Y and Z axis and begin scaling it until the tube is flattened to look like the vertical stabilizer. Select Cross Section mode, Scale mode and begin shaping the tube to look like the backdrop. You will have to rotate the lower Cross section to match the top of the fuselage. To do this, select Rotate mode and drag the cursor over the side view until it is in the right position. You can remove all the Cross Sections in the center for now, we can add them as needed. It's easier to shape the airfoil with the least number of cross sections and when we add them back in, they conform to the shape. Once you have the approximate shape of the Vertical Stabilizer in the side view, select Point Mode, Move Mode, Restrict the X axis and begin moving points to make the curvature at the top and the front of the Stabilizer. At this point we want to move points to form the rudder too.



You'll notice the Rudder is corrugated. We can duplicate this a couple of ways, one is with textures, which we'll discuss later on. The second way would be to add Cross Sections and form the high and low sections of the rudder. This would involve some special handling once we Split the rudder from the tube. I will show you what it would involve, but I suggest for your first project that you stick to textures. Once we begin adding Cross Sections, this part will get very busy. Before we begin Save the Vertical Stabilizer by selecting Part Mode, Part, Save and naming it Vert Stab 1. Now one by one add Cross sections until you have enough to make the high and low sections of the corrugated rudder. Don't worry about Scaling just yet, allow the Cross Sections to conform to the shape you refined here.



Once you have enough, select Polygon Mode, the selection Tool and select all the polygons that form the rudder. Select Part, Split Part. Then right click name it Rudder, open the presets menu and select AA rudder, then set always display. Now save the part as Rudder 1. Since we split the part, you'll need to close the front edges in like we did with the Inner fuselage by Selecting Point Mode and using the selection tool to select the points along the front edge of the rudder and then do the same with the angled front section of the rudder. When we Split the rudder from the vert stabilizer, we probably selected the top polygon that runs along the entire top of the stabilizer too. So you'll need to cycle through the polygons and delete it. You can save yourself some time by splitting the top of the rudder from the lower section and removing the polygon. When you have removed it, you can rejoin the top section to the lower section again. You'll have to close the top of the rudder. Do this by selecting Point Mode and using the Selection Tool select the points one section of the top at a time. This will avoid having the top end up concave when we do a Part Check to fix all the non-planar polygons. Now cycle through the Parts using the "N" and "P" keys until you select the vertical stabilizer we added all the Cross Sections to get the corrugated rudder. Delete this part, we will use the original vertical stabilizer. Now you have your work cut out for you. Select Point Mode and using the Selection tool, you can select the center pairs of points on the left. Be sure you select every other pair. Once you have selected all the points you want to move, restrict the Y and Z axis, hold the "Shift" key and using the "Directional" keys, nudge the points left or right, which ever you prefer. Now do the same with every other pair of points on the right. Once you have finished you'll have a corrugated rudder. Right click on the window, select Current Item Properties, name it Rudder, open the presets menu and select AA rudder, then set always display. Then save this as Rudder.


Cessna 185 working.fsc - FS Design Studio
File Edit View Mode Part Polygon Transform Cross Section Template Help
Solid View Controls
Zoom
Key Light
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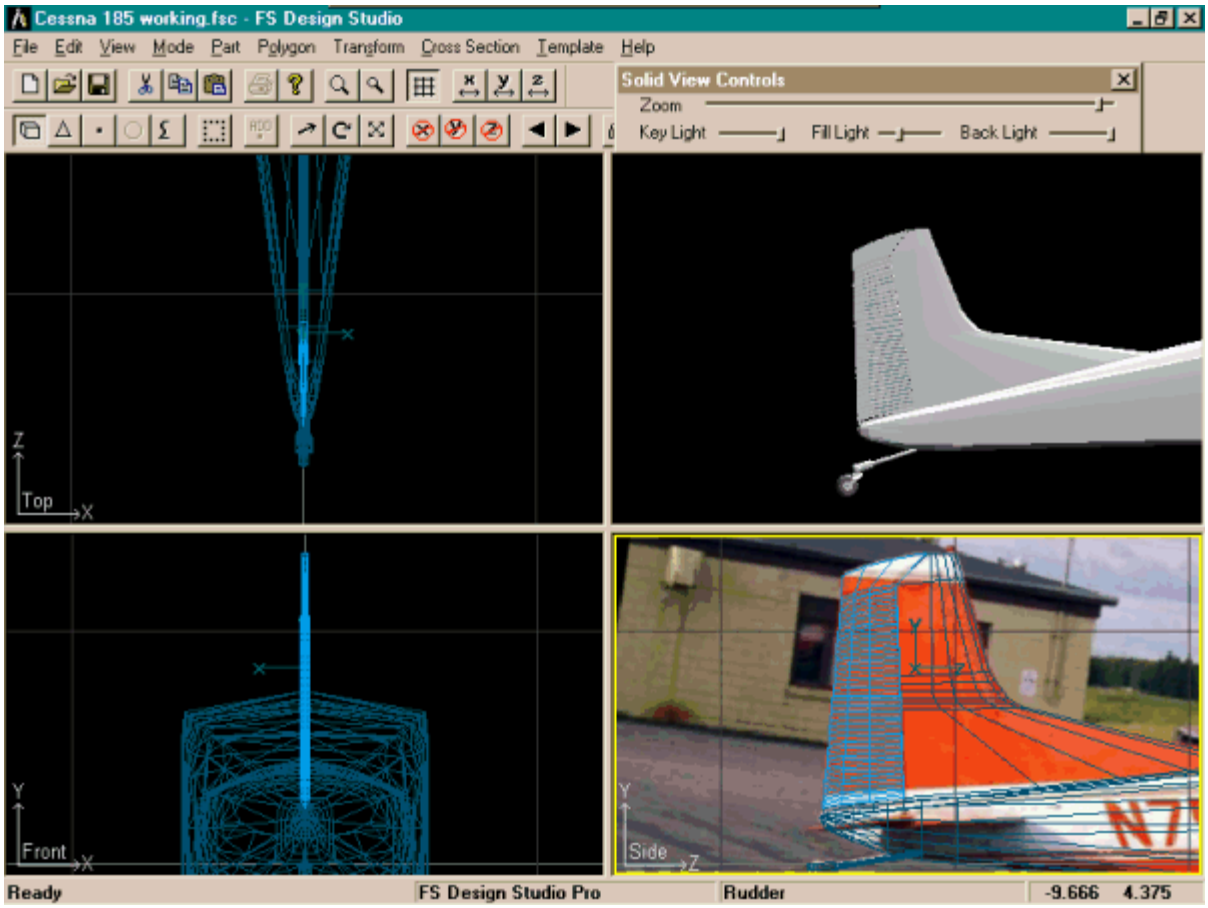
Back Light
Top
Front
Side
Ready
FS Design Studio Pro
Rudder
-0.057 -11.833


Cessna 185 working.fsc - FS Design Studio
File Edit View Mode Part Polygon Transform Cross Section Template Help
Solid View Controls
Zoom
Key Light
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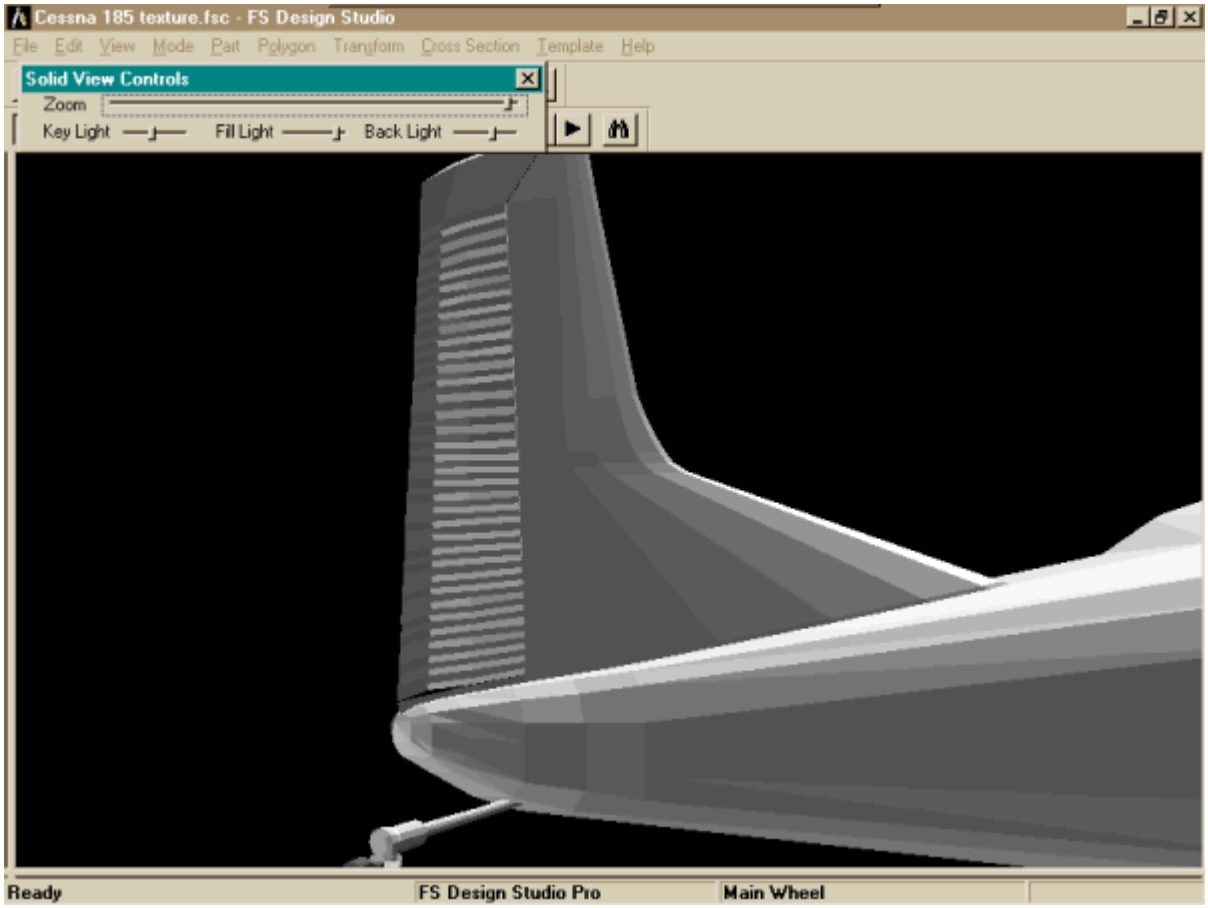
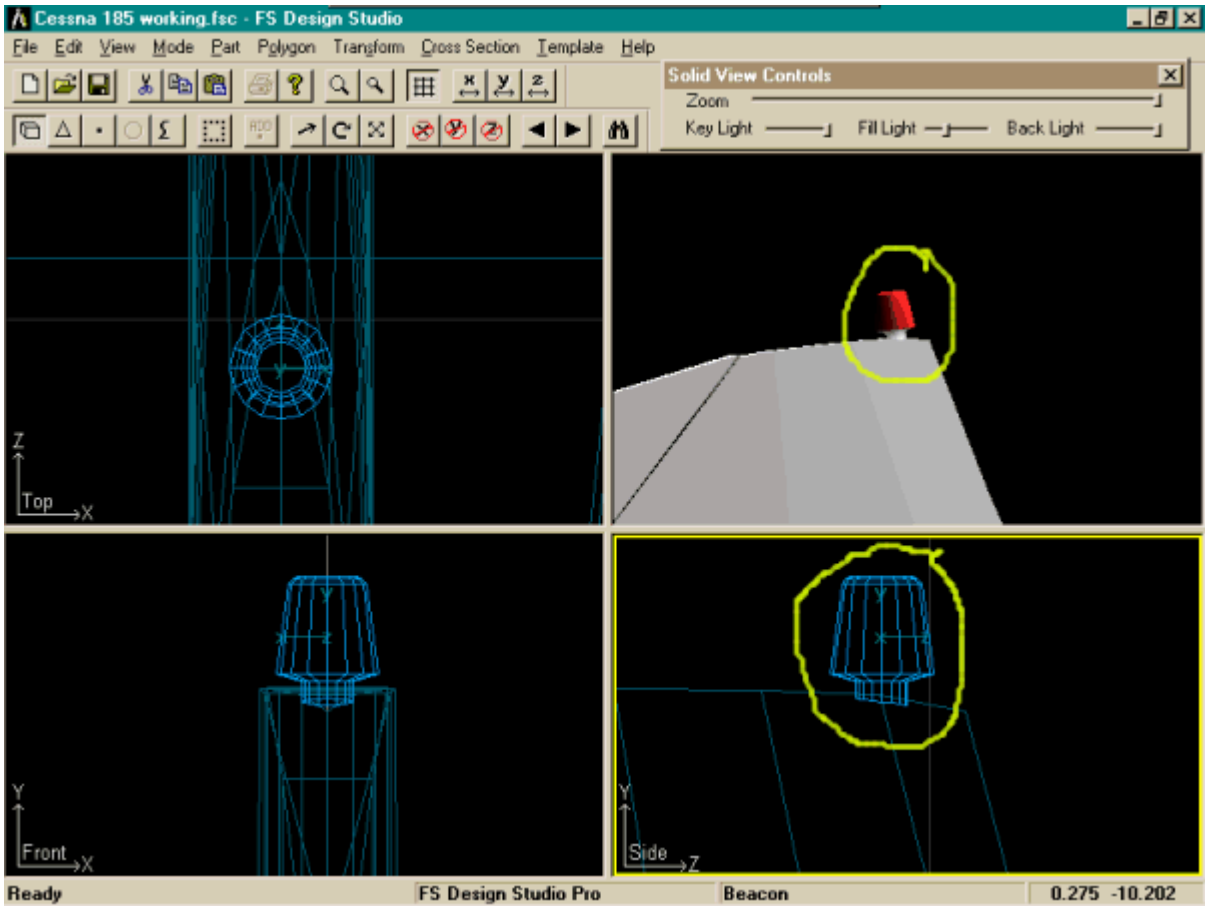
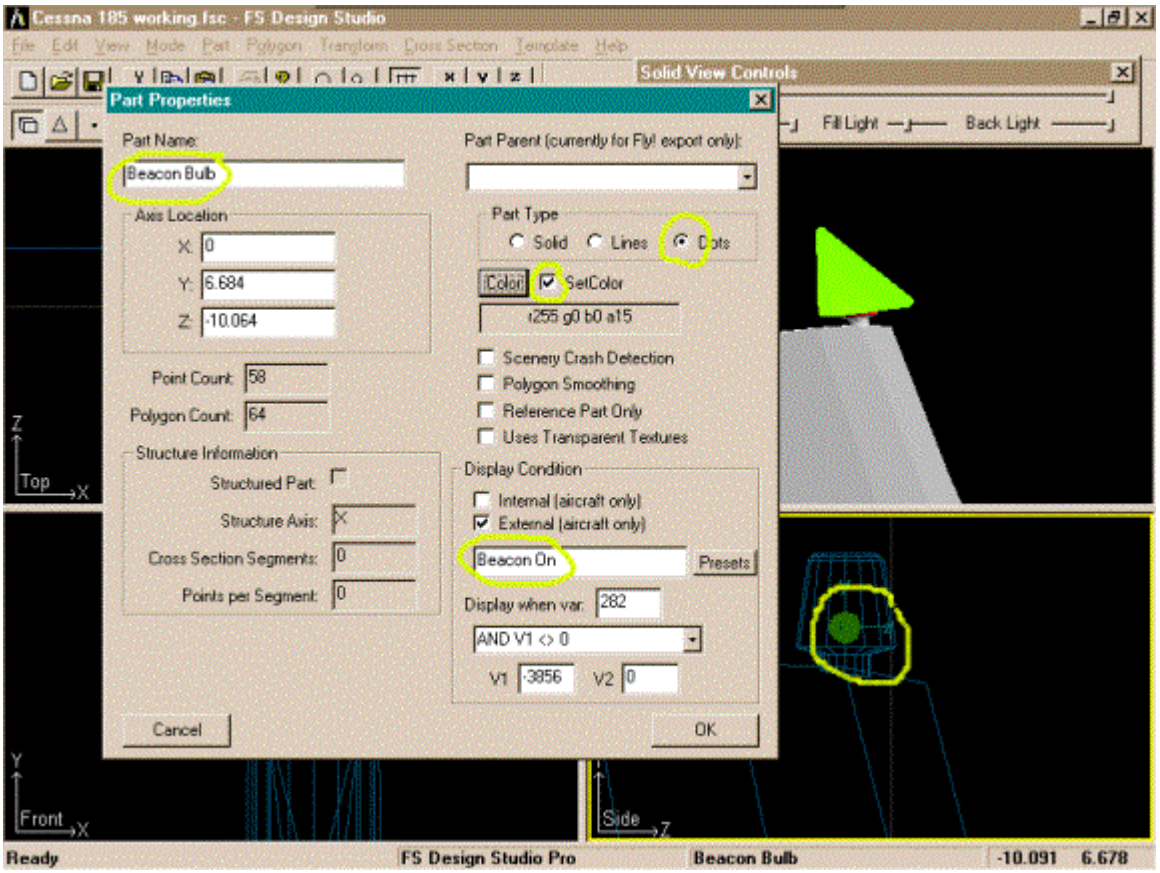
FS Design Studio Pro
Rudder
-9.666 4.375



You will probably have to go through and tidy up all the points to make straight lines again, but it will be worth it to have a realistic rudder. When we get ready to texture we'll leave the Polygon Smoothing turned off for the rudder and other corrugated control surfaces. This will allow the corrugation to show. As one final step to finishing the vertical stabilizer we'll add the beacon. So add a tube, set radius to.1, length to .5, 5 sections, long axis Y and 12 sided. Scale this down to look like the beacon and move it to the top forward part of the vertical stabilizer. I shaped it and then split the top part to make it a red, transparent cover and then rejoined to the base again.



Next let's add a glowing bulb to it and tag the bulb as a beacon. To make this, load a sphere and resize it to the approximate size of a bulb within the beacon cover. Right click and select Current Item Properties, name it Beacon Bulb, set it as Dots, then select presets and tag it as beacon on and set the color as red, bright, opacity 15. Then save this part as Beacon Bulb.


Cessna 185 working.fsc - FS Design Studio
Part Properties
Part Name:
Beacon Bulb
Part Parent (currently for Fly! export only):
Axis Location
X: 0
Y: 6.684
Z: -10.064
Part Type
Solid
Lines
Dots
Color
SetColor
r255 g0 b0 a15
Point Count: 58
Polygon Count: 64
Scenery Crash Detection
Polygon Smoothing
Reference Part Only
Uses Transparent Textures
Structure Information
Structured Part:
Structure Axis: X
Cross Section Segments: 0
Points per Segment: 0
Display Condition
Internal (aircraft only)
External (aircraft only)
Beacon On
Presets
Display when var: 282
AND V1 <> 0
V1 -3856
V2 0
Cancel
OK
Solid View Controls
Fill Light
Back Light
Top
Front
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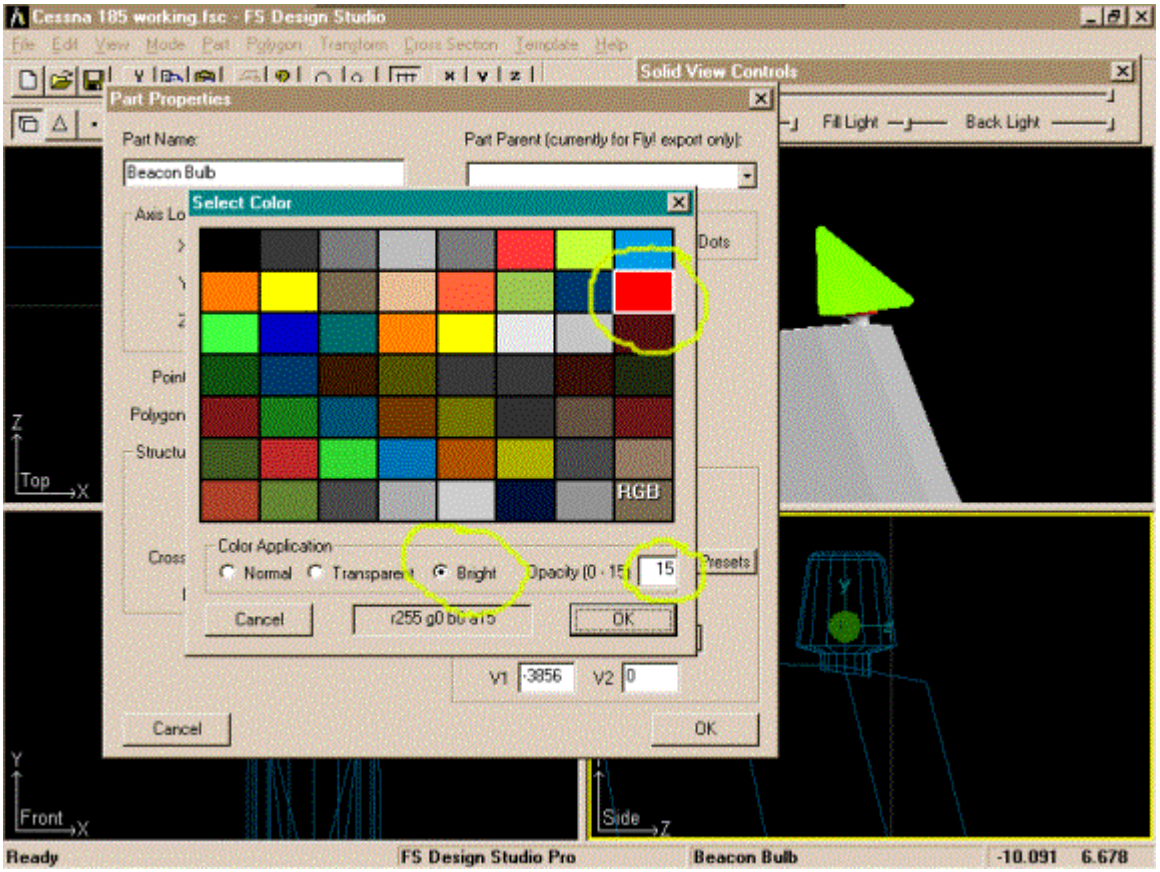
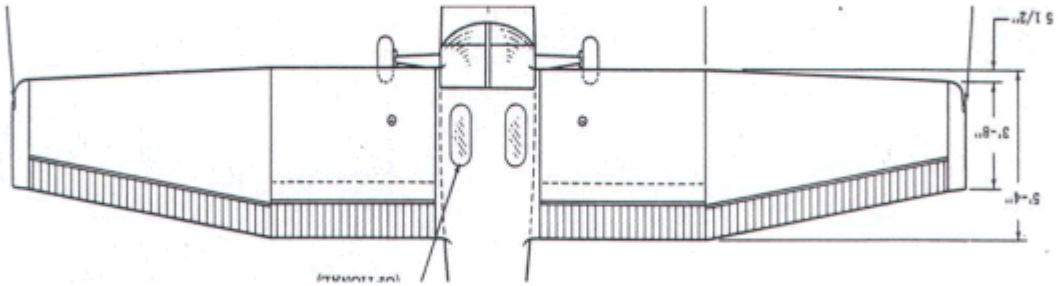
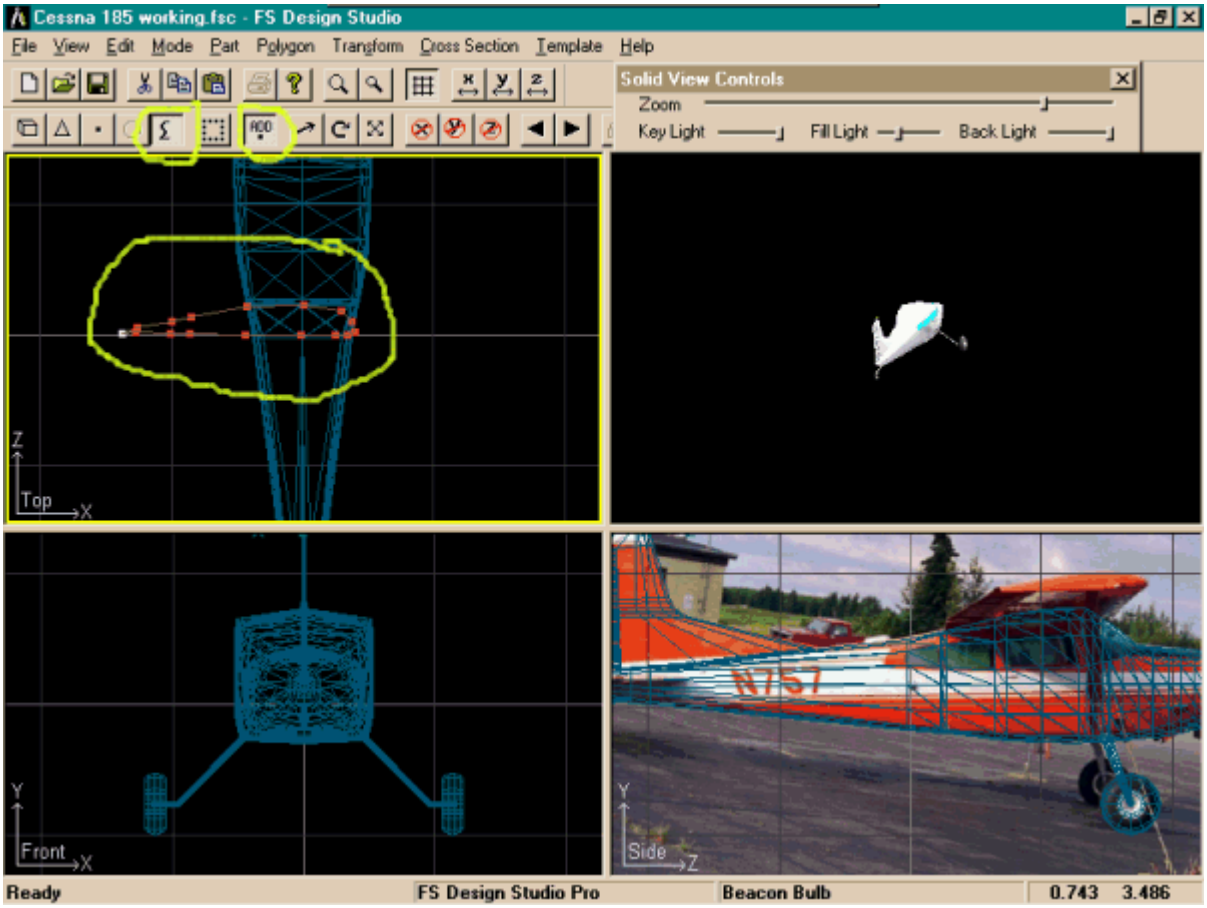
Ready
FS Design Studio Pro
Beacon Bulb
-10.091
6.678


Cessna 185 working.fsc - FS Design Studio
Part Properties
Part Name:
Beacon Bulb
Part Parent (currently for Fly! export only):
Select Color
RGB
Color Application
Normal
Transparent
Bright
Opacity (0 - 15)
15
Cancel
r255 g0 b0 a15
OK
V1 -3856
V2 0
Presets
Solid View Controls
Fill Light
Back Light
Top
Front
Side
Ready
FS Design Studio Pro
Beacon Bulb
-10.091
6.678

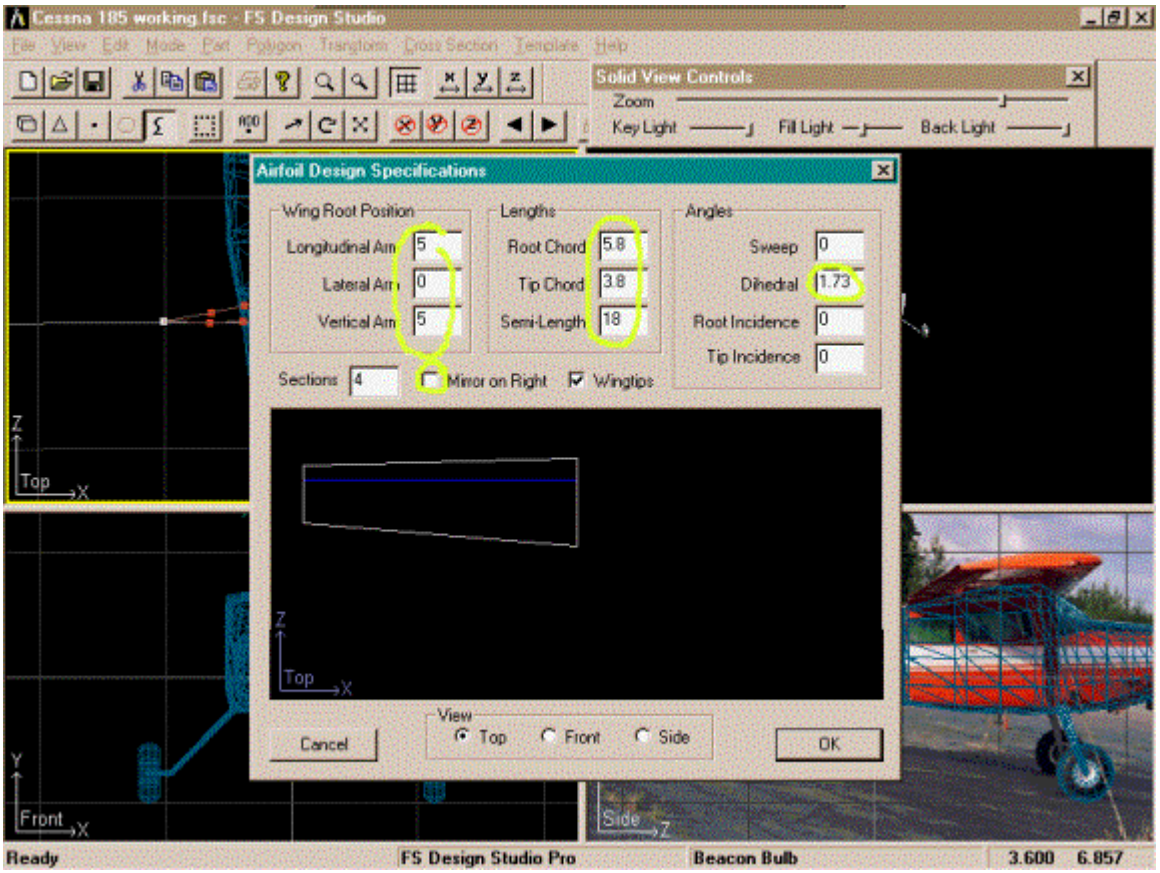
Now let's work on the main wing. From the top it will look like this drawing.



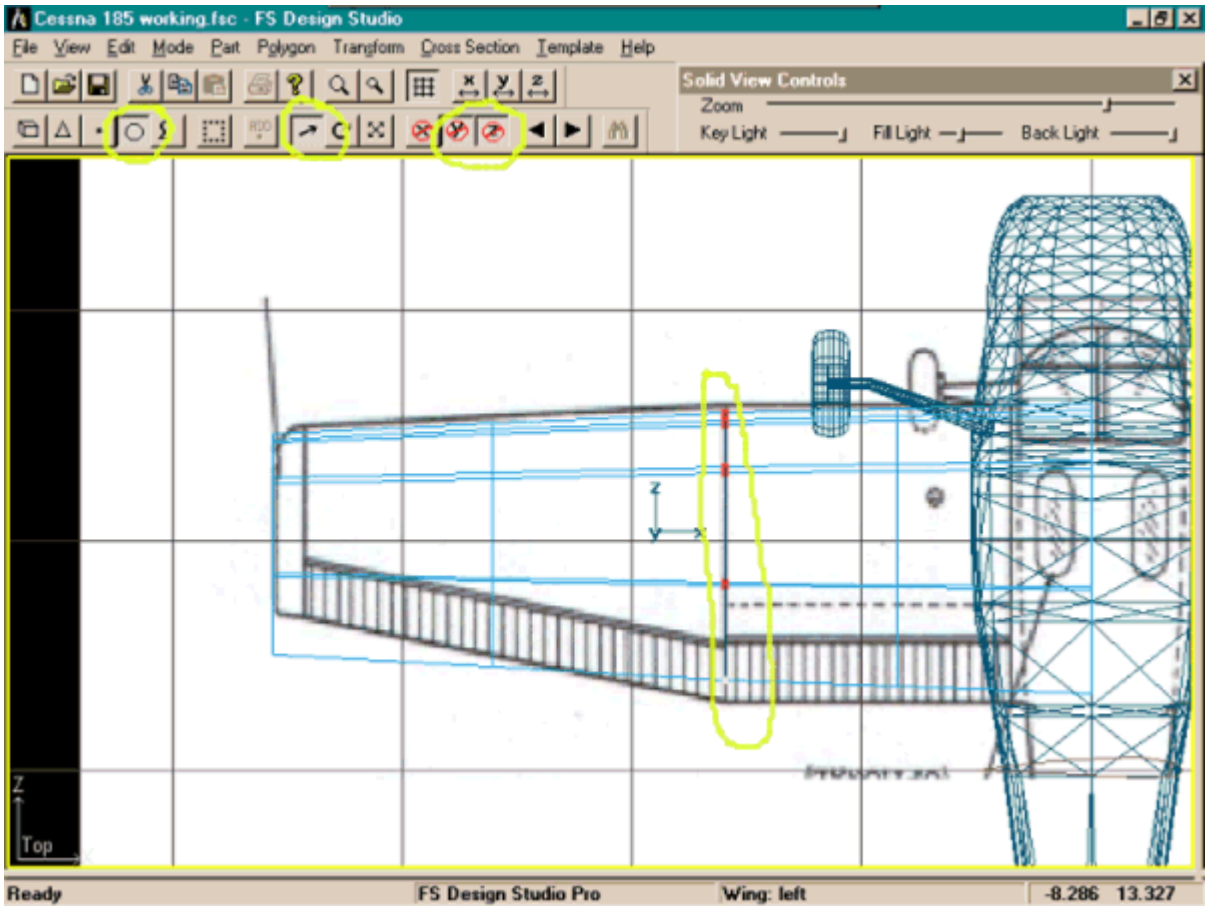
The wingspan will be 36' 0". If it will help you, convert the wing image to a bitmap and use it in the top view as a backdrop. We'll begin by making a template to produce our wing from. Select Template Mode and the Add Point Button. Begin on the X Axis line and place 16 points, 7 on top, 7 on the bottom and one at the front and rear of the wing. Remember this is an airfoil so it will be rounded on top and flat on the bottom. If you make a mistake select Template, Clear from the menu. Once you have a template you like, save it as C-185wing.cdt by selecting Template, Save from the menu.



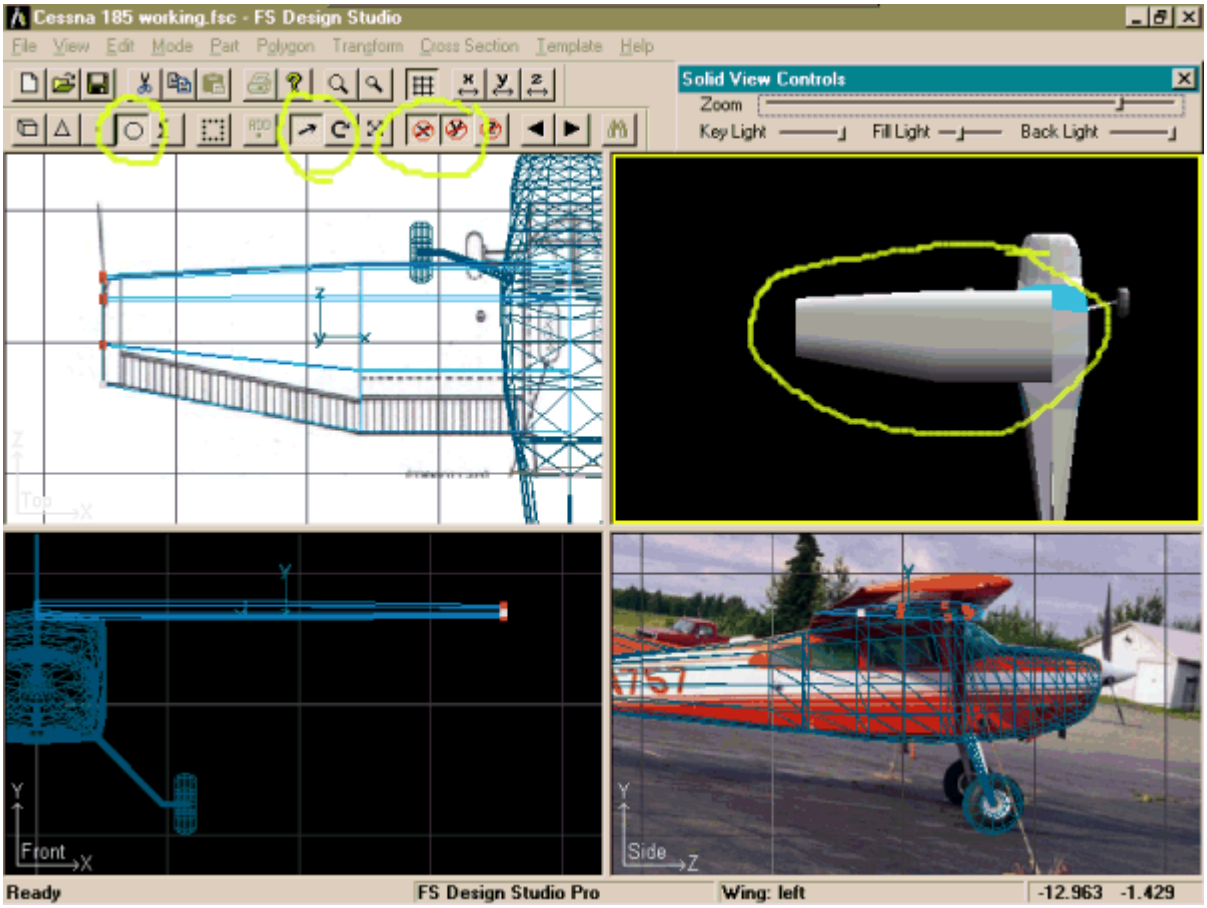
Then select Template, Wing Wizard and set the Longitudinal Arm to 5, the Vertical Arm 5, the Root Chord to 5.8, the Tip Chord to 3.8, Semi-Length to 18 (because it's a 36 ft wingspan), Sections 4, Wingtips and Deselect Mirror on the right because we are going to do lots of editing of this wing and use it to make the flaps and ailerons. Leave the angles set as 0 except the dihedral, we'll set it as 1.73 . Then click ok to produce your wing.



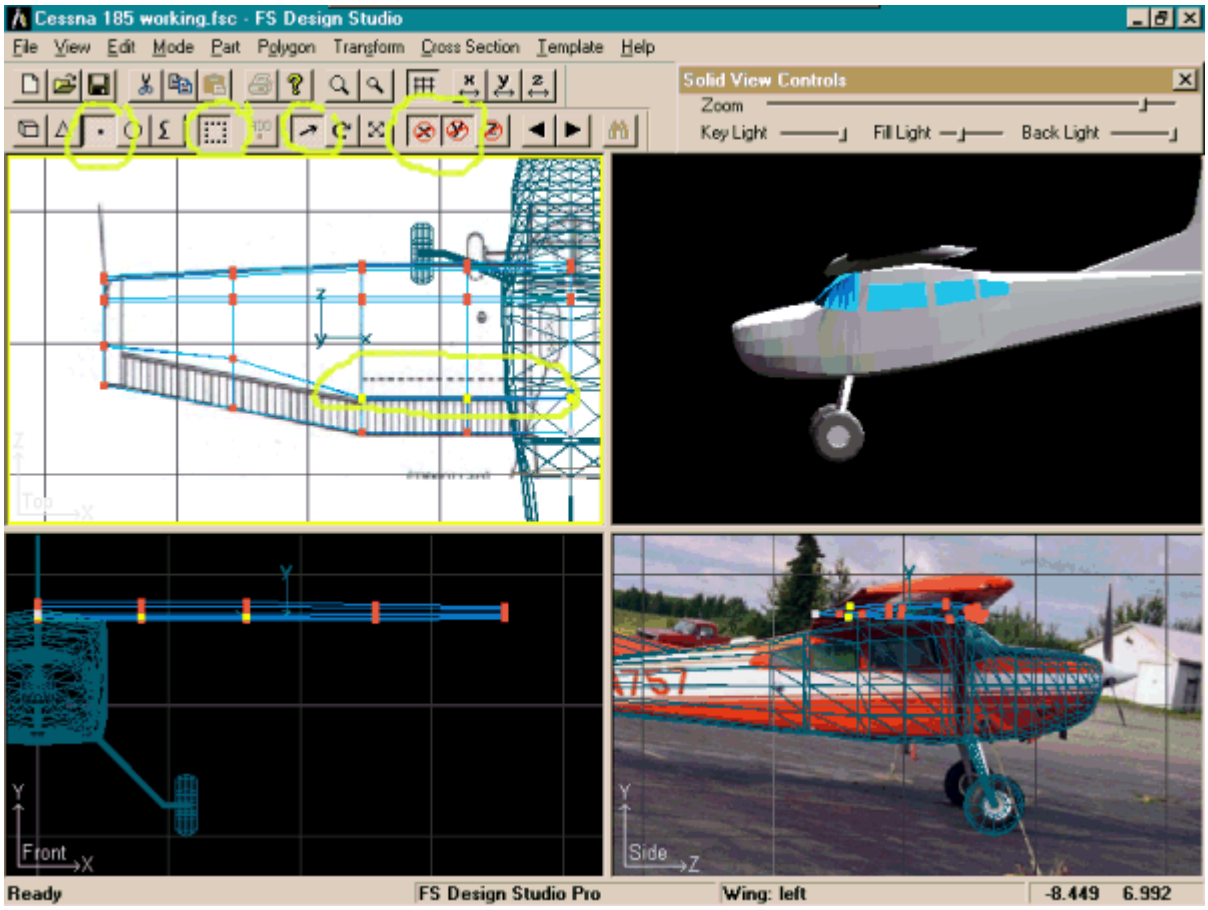
Now select Move Mode, restrict the X axis and drag the wing over the .bmp of the wing shape in the top view. Don't worry if it appears too high, we'll position it when we have finished editing it. Select Cross Section Mode, select Move mode retrict the Y axis and the Z axis press "N" and "P" until you have selected the center Cross section and drag it to the point on the wing where it changes shape.



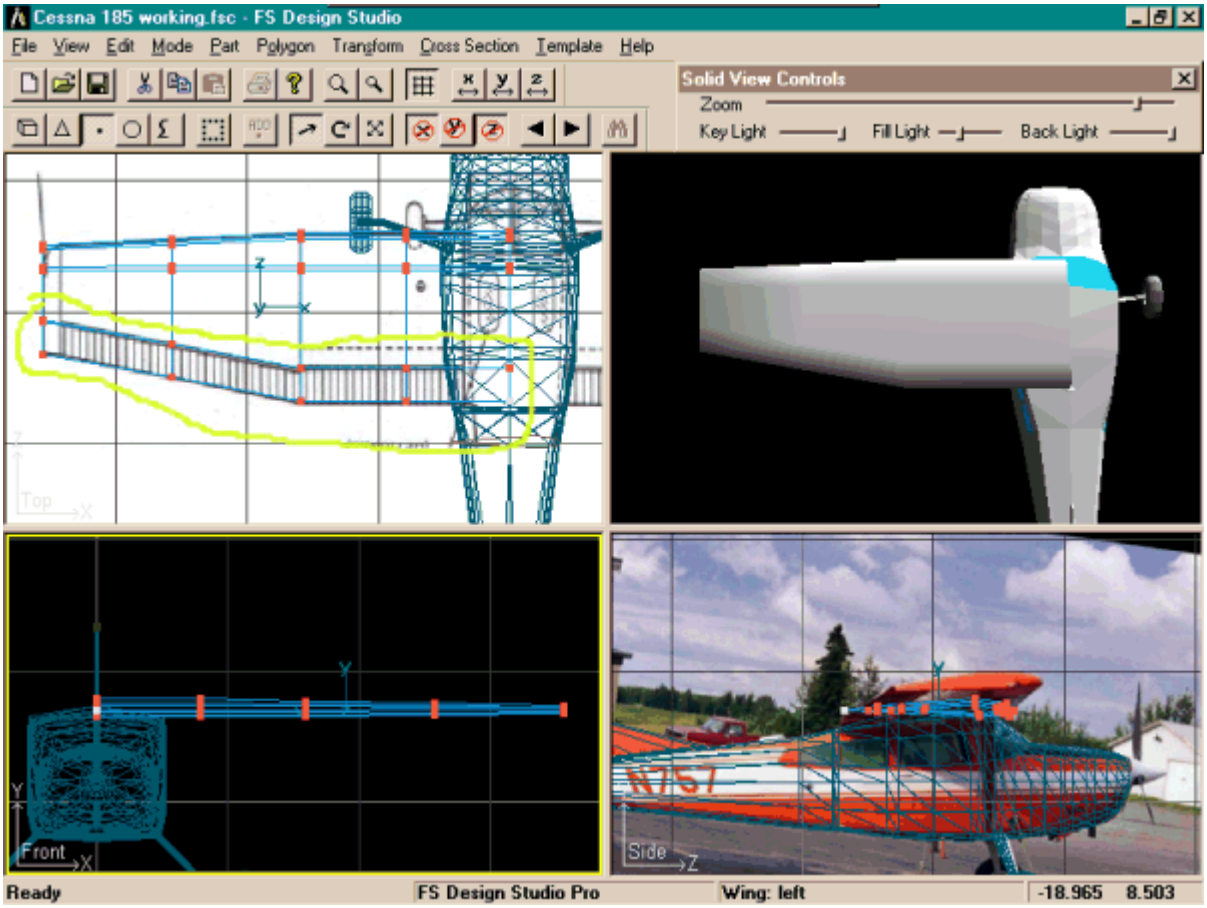
Now press "N" and "P" until you select the the other 2 center Cross and move the one towards the end out to where the edge of the aileron is and move the inner one to where the wing intersects the fuselage . Now select Scale Mode, Restrict the X axis and one by one resize the Cross Sections until the wing takes on the shape of the backdrop. You'll have to move the wingtip foreward so be sure you restrict the X and Y axis before doing this. When you have finished, your wing will look something like this. When you have a shape you are comfortable with save it as Wing L.



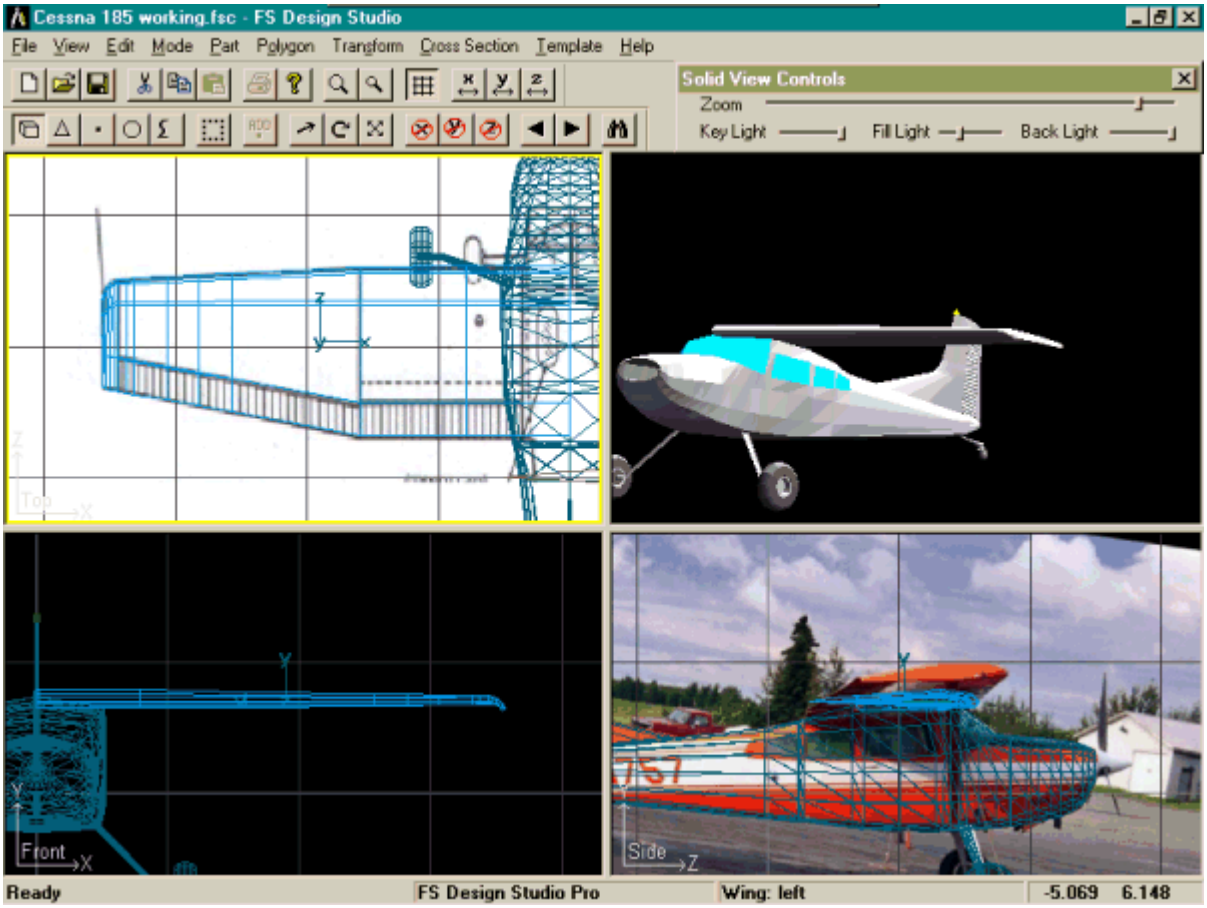
Now we need to move some points to outline the flaps and ailerons. To do this, select Point Mode and use the Selection Tool to select the points we'll move in the Z axis only so restrict the X and Y axis.



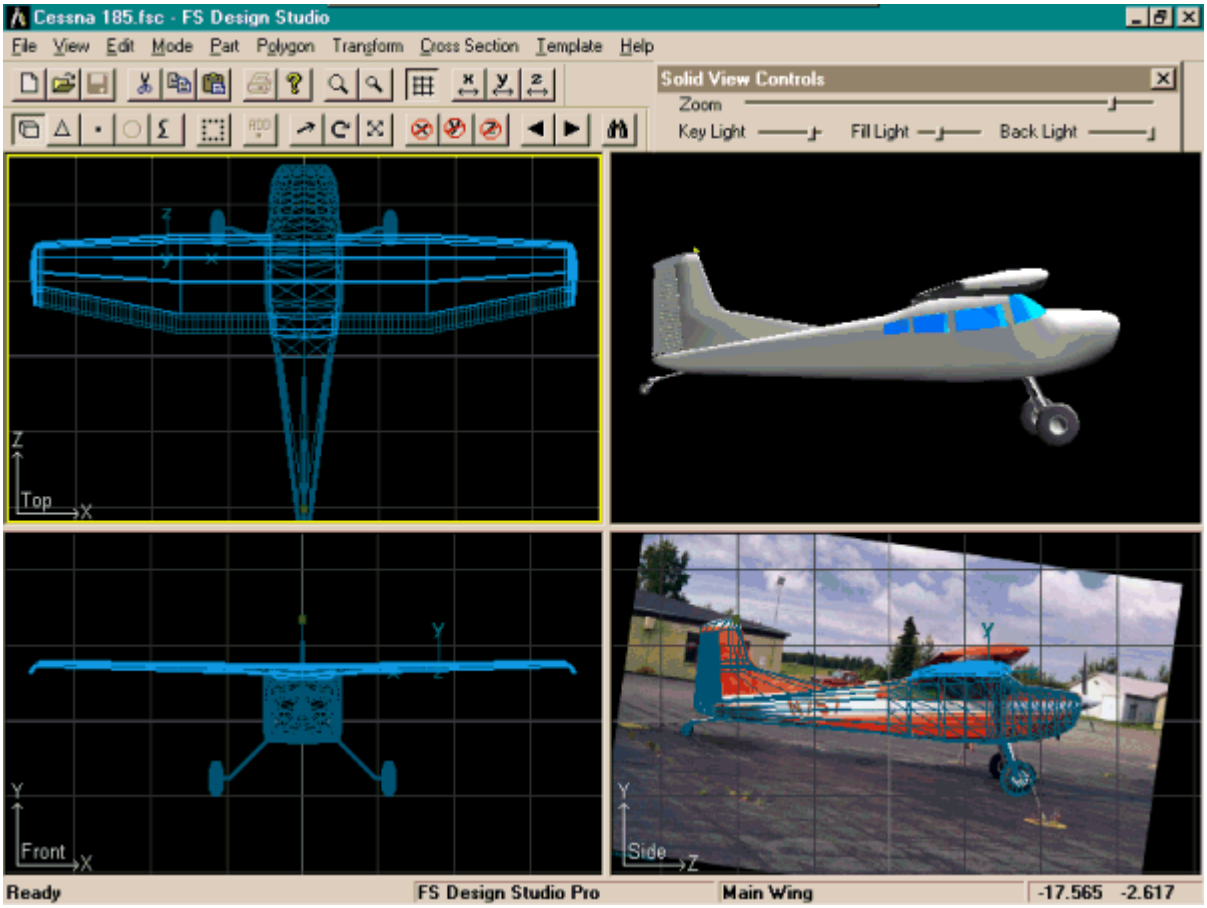
Before we select the next points to move, let,s fix these in the Y axis. In the side view, use the Selection Tool, select the upper points and drag them down just a little to flatten the upper surface of the wing. Restrict the X and Z axis and unrestrict the Y axis before you move them. An alternate would be to click on the side view and holding the shift key press the down directional key to nudge the points down. Then nudge the lower points up by holding the shift key and pressing the up directional key. Now move the remaining points rearward on the wing to outline the aileron and nudge them up and down as needed. When you have finished, it will look like this.



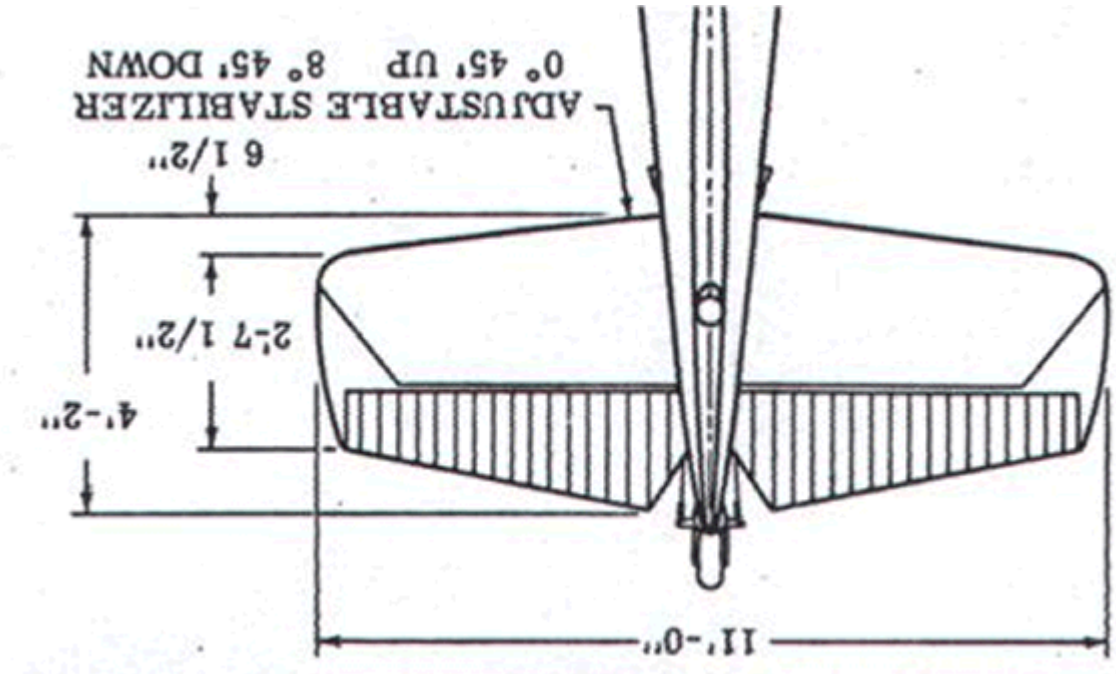
Rotate your aircraft in the perspective view and have a close look at it before moving on to the next step. Save the part again as Wing L and then begin adding cross sections until you have outlined the aileron and flap and can form the rounded wingtip. You'll notice the wing we just made doesn't exactly line up with the backdrop. This is not due to the way we have constructed it but is the fault of the paralax in the picture itself. You'll also notice the plane in the picture has droops or Vortex Generators at the tip. These enhance short field performance and you can easily construct these by adding enough Cross Sections at the tip and dragging then down one at a time until you have a rounded drooping wingtip. To make the Thickness continuous you can rotate the Cross sections as you move them down. Once we have refined the shape of the wing, save it again as Wing L. Now begin adding the Cross sections to the wing to make the corrugation on the flap and aileron like we did with the rudder.

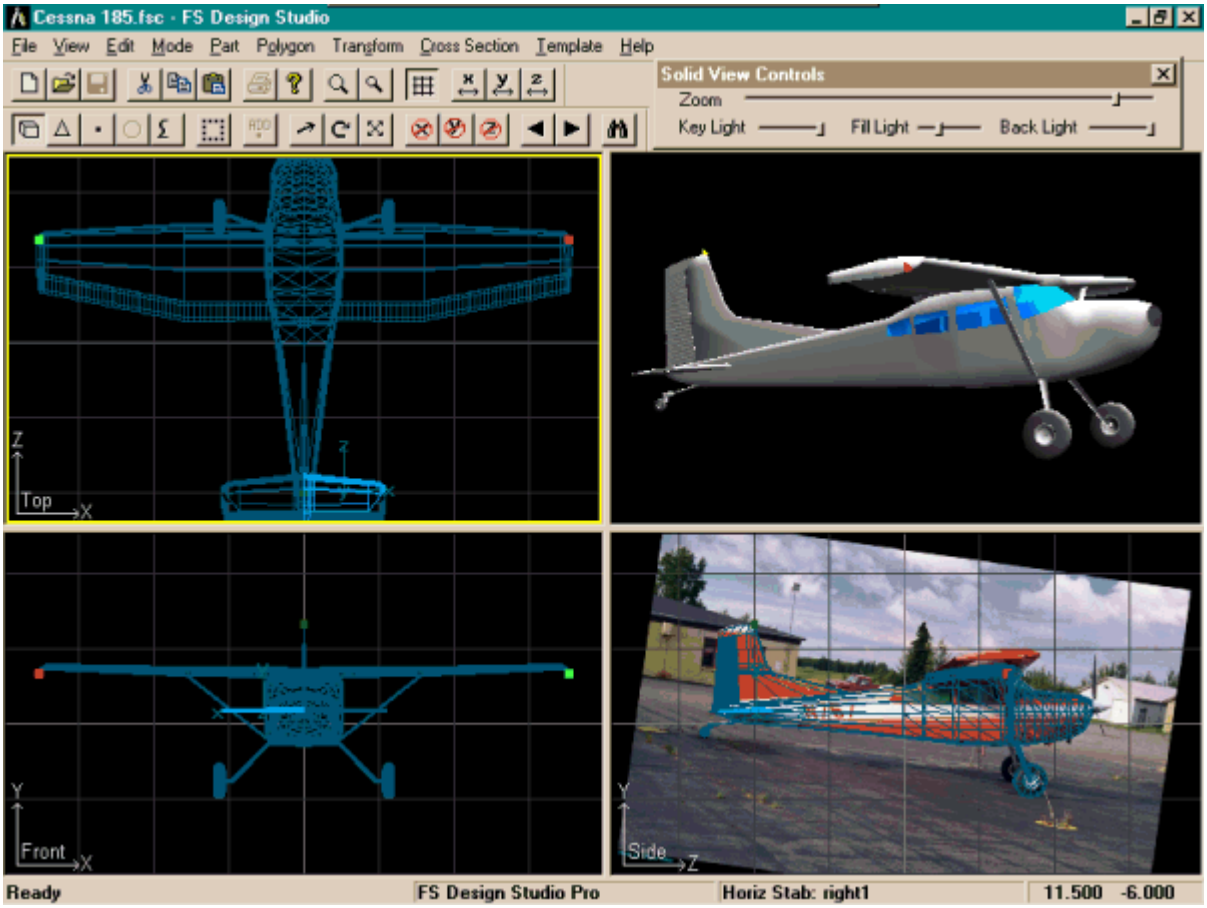


Select Polygon Mode and using the Selection Tool, select all the polygons that make the flap. Then select Part, Split Part, right click, select Current Item Properties, name it Flap Left, open the presets menu and select AA flap, then set always display and save it as Flap L. Then using the Selection Tool, select all the polygons that make the aileron , select Part, Split Part, right click, select Current Item Properties, name it Aileron Left , open the presets menu and select AA left aileron, then set always display and save it as Aileron L. Select Point Mode and using the Selection Tool select all the points along the ends and front edge of the aileron and flap and make a polygon out of them like we did with the rudder. Now using the "N" and "P" keys select the wing , select Point Mode and using the Selection Tool select the points where we split the flap and aileron from the wing and make polygons to close these surfaces. Next, we'll use Ctl "C" to copy the wing and ctl "V" to paste it. Select translate, flip Y, Select translate, Rotate, Z 180 . Right Click, name this part Wing R and save it. Do the same with the flap and aileron but tag the right aileron as AA aileron right and always display. Congratulations, You have just made the main wing! You will have to go through and make adjustments to points that intersect the wing such as the windscreen and fuselage. Another thing you can do is to select the polygons on the underside of the wing where it intersects the fuselage so the cabin ceiling looks like it should. Now save the Project files and then using the same methods as we did for making the main wing fabricate the horizontal stabilizer and elevators. You'll tag the elevators as AA elevator and always display.



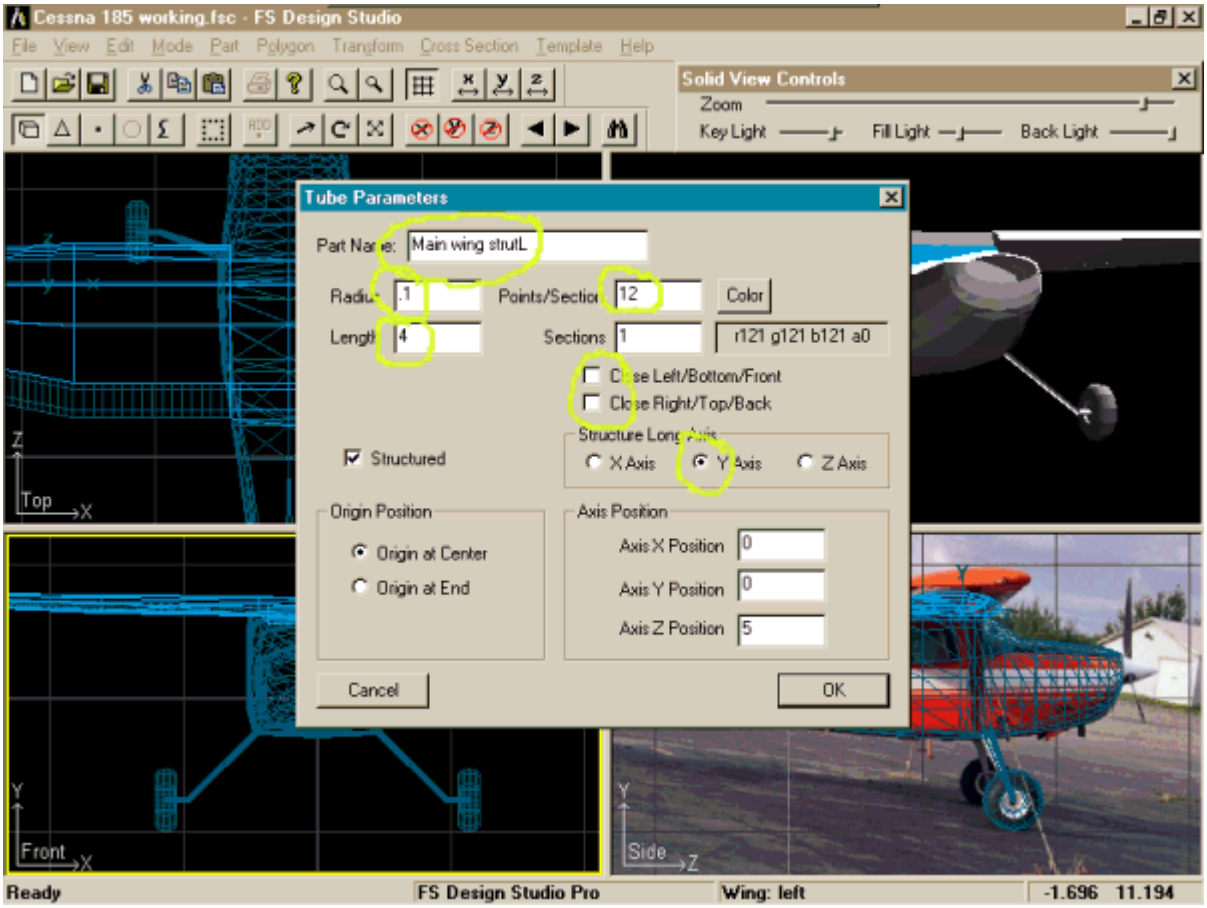
Here's a picture of what the horizintal stabilizer will look like, you can convert the picture to .bmp and use it as a backdrop to help with shaping just as you did with the main wing.



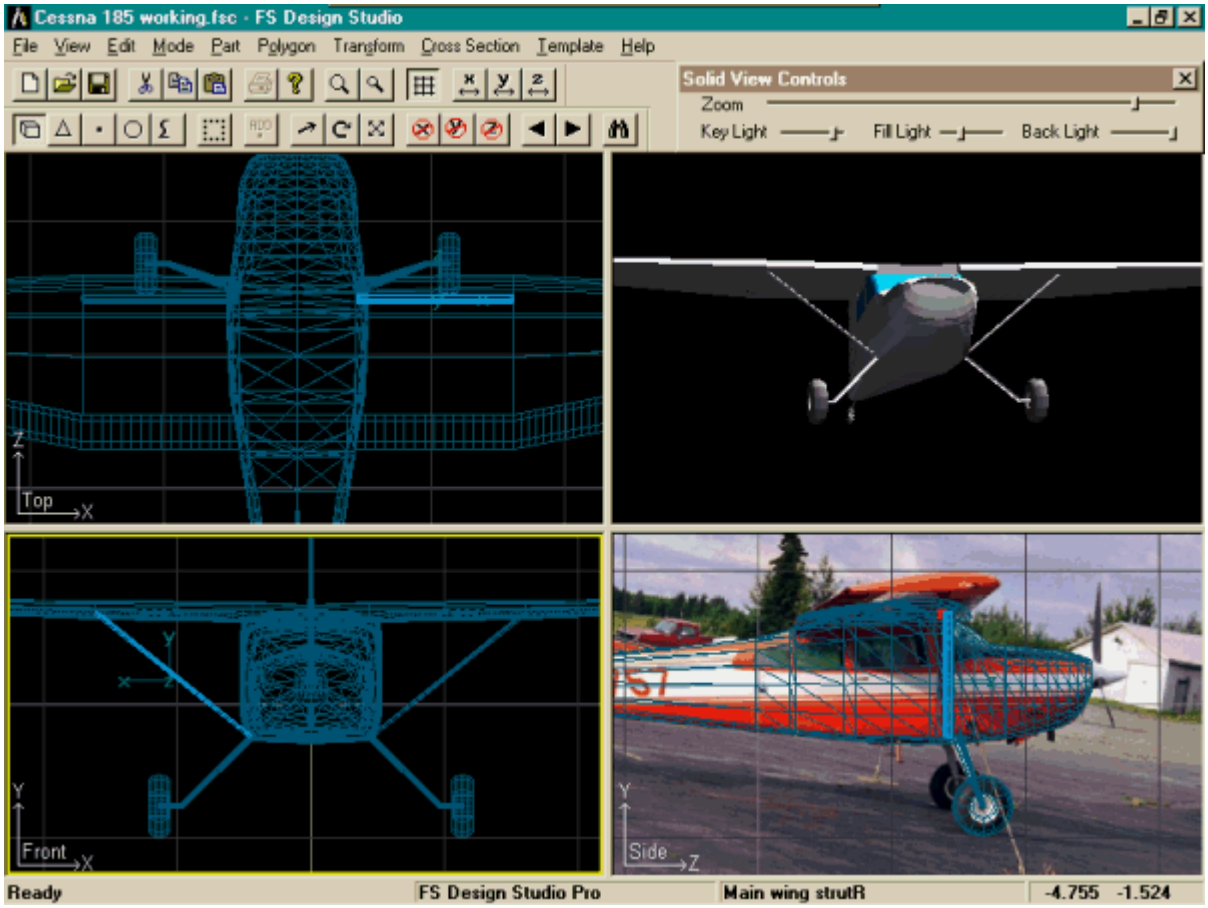


Now all we have to do is put some navigational lights on the Main wing tips and a strobe on the tail of the fuselage. You can do this by selecting polygons at the tip of the wings and then splitting the part. Make the right navlight red and the left navlight green set it as transparency, opacity 15. This will be the lens so it will always display. You will have to make the inside of the navlight so I suggest you copy and paste the wing to split the lens from it then delete the leftover wing. Once you have made the lens and the light socket you can make a bulb as we did with the beacon and this time use navigation lights display condition from the preset list.

Now let's add the main wing strut by adding a tube. Make the radius.1, length 4, 1 section and 12 points per section.



Scale it until it fits the backdrop in the sideview then restrict the Y and Z axis and flatten it out to streamline it. Next select Translate and rotate it in the Z axis 55 degrees.Move it into position until the bottom intersects the top of the landing gear strut . If it needs lengthening, rotate it back to vertical(-55 degrees in the Z axis) and scale it in the Y axis. Once you have one strut, you can copy and paste it, then translate by flipping in the Y axis and rotating Z 180.



Here's what it should look like with textures applied to it.

Part 2 Part 4