# FS Design Studio

Making an Aircraft - Tutorial Part 4, by Ron Anderson

Now we need to add the engine, prop and some reference points in preparation for producing our aircraft. Let's b
by making the engine that will be visible through the cooling duct at the front of the cowling. You will see part of
engine block and the two front cylinders.

You can see by this picture that there are other items to add to the details of this aircraft such as cowl flaps at the
bottom near the exhaust pipe, an oil cooler below the spinner and two landing lights. You can make the landing lig
operable and add a glowing bulb or light beams as you see in FS2000 by using SDL macros and conditional tags a
described in the help files. These are advanced features and the subject of another tutorial. You can also make the
cooling cowl flaps and animate them by using the spoiler tag to keep things simple. I suggest you split them from
cowling and add a dark gray polygon behind them so when they open you are not looking at the rear of your simp
engine. If you want to have a more realistic look later on you can make the parts that would be visible and add m
detail. My feeling on detail is to keep things simple and use textures as often as you can. Textures can go along w
toward adding increased detail and keeping the model from becoming unmanageable. The oil cooler and lights for
matter can be added using textures. I used the reflective surface of the lights in this picture as a texture for the li
themselves and then covered it with a transparent lens. It is very effective to make a realistic looking light. Just k
in mind that there are limits and you can cause big frame rate hits by using too much detail. My suggestion is to r

a polygon just behind the opening and use a texture to make the cooling fins on the cylinders. Then add a tube a[r]
Scale it to look like the spinner. Right click on the screen once you have the desired shape and using the Presets
menu tag is as AA Prop 1
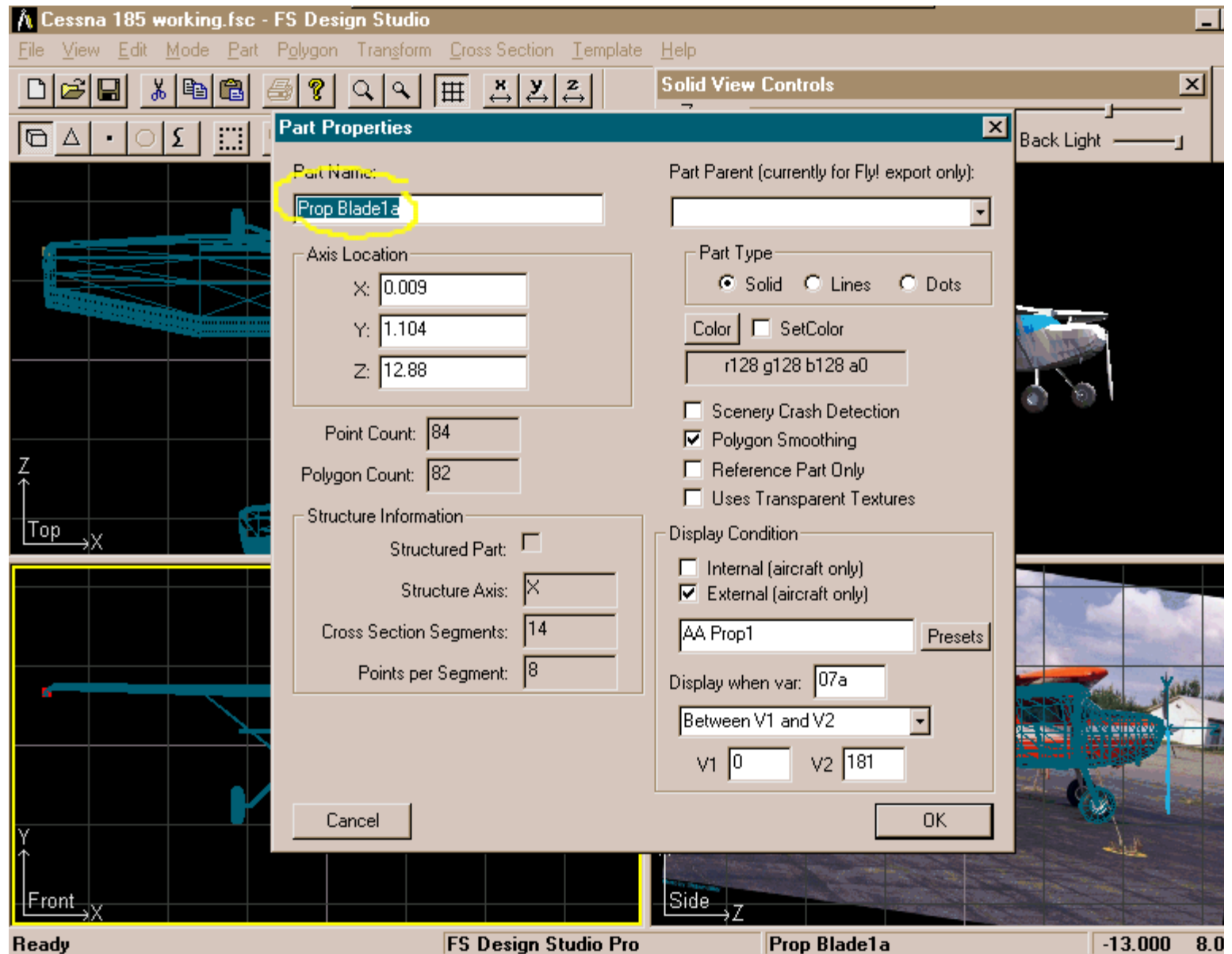
Now we can use the wing wizard to make a prop. Let's begin by making a simple template with 12 points. Select
Template Mode, Add Points and lay out the 12 points in the shape of a wing. Then select the Wing Wizard and set
Longitudinal Arm as 5, Vertical Arm as 5, Root Chord as .7, Tip Chord as .7 and deselect Mirror on Right.
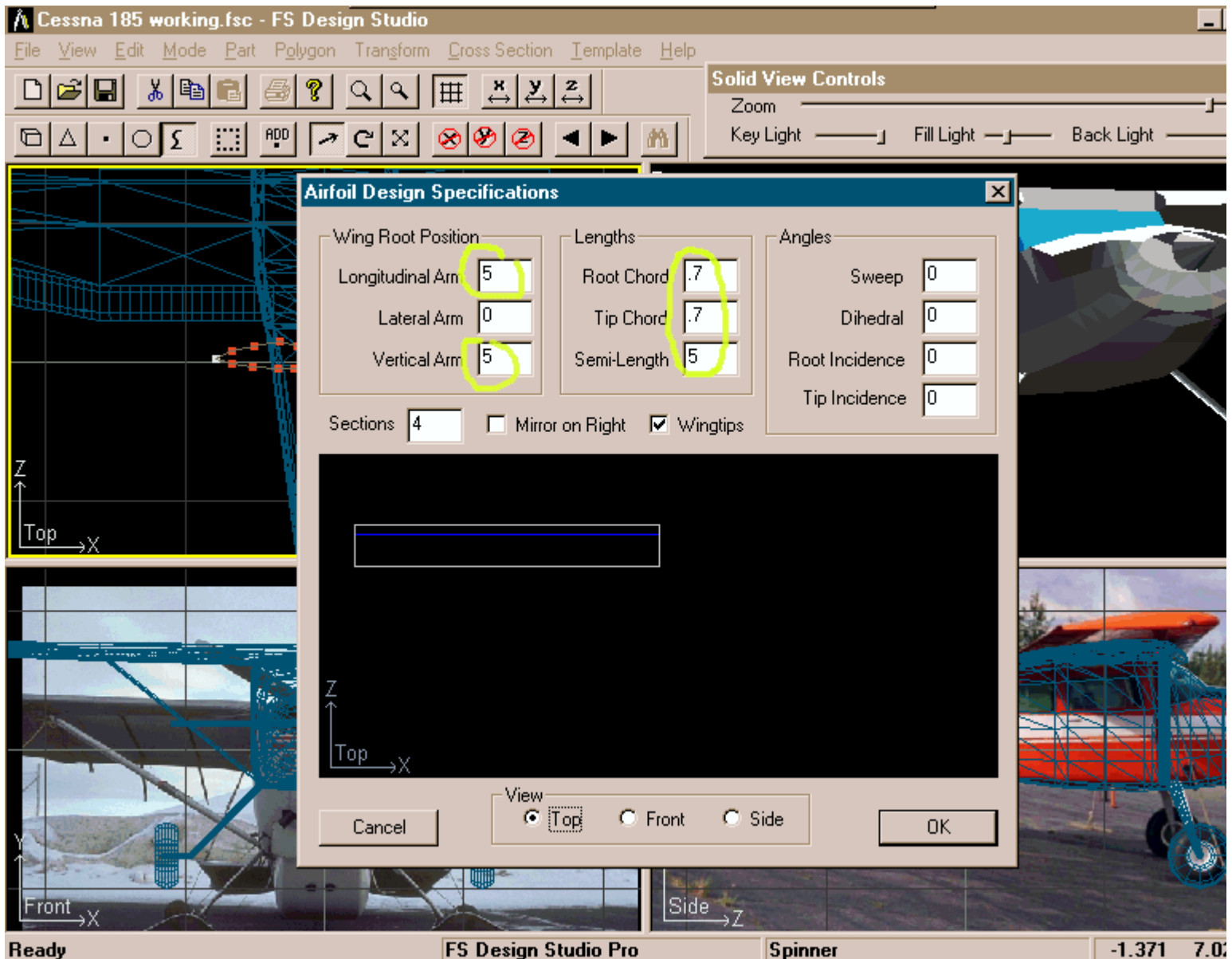
Select Move Mode and drag it foreword to the spinner. Rotate it until it is vertical and move it until it is pointing straight up and down below the spinner. Scale, Add and Rotate Cross Sections until you have an acceptable prop shape. One by one you can select and rotate the Cross Sections until it has a twist to it like a real prop. Don't ove rotate though, 30 degrees should be enough. Before we save it I suggest you select Edit and Check Parts for Non-Planar parts. Name it Prop Blade and save it. Now right click, select Current Parts Properties and name it Prop Bla 1, select Presets and choose AA Porp1. Now press Ctl "C", Ctl "V" and rotate this part 120 degrees in the Z axis. Select Move Mode, restrict the Z axis and move this blade into position. Copy and paste this blade, rotate it 120 degrees in the Z axis and move it into position too. Name each one sequentially as Prop Blade 1,2 and 3 and save them as the same name and tag them as AA Prop 1from the Presets menu.
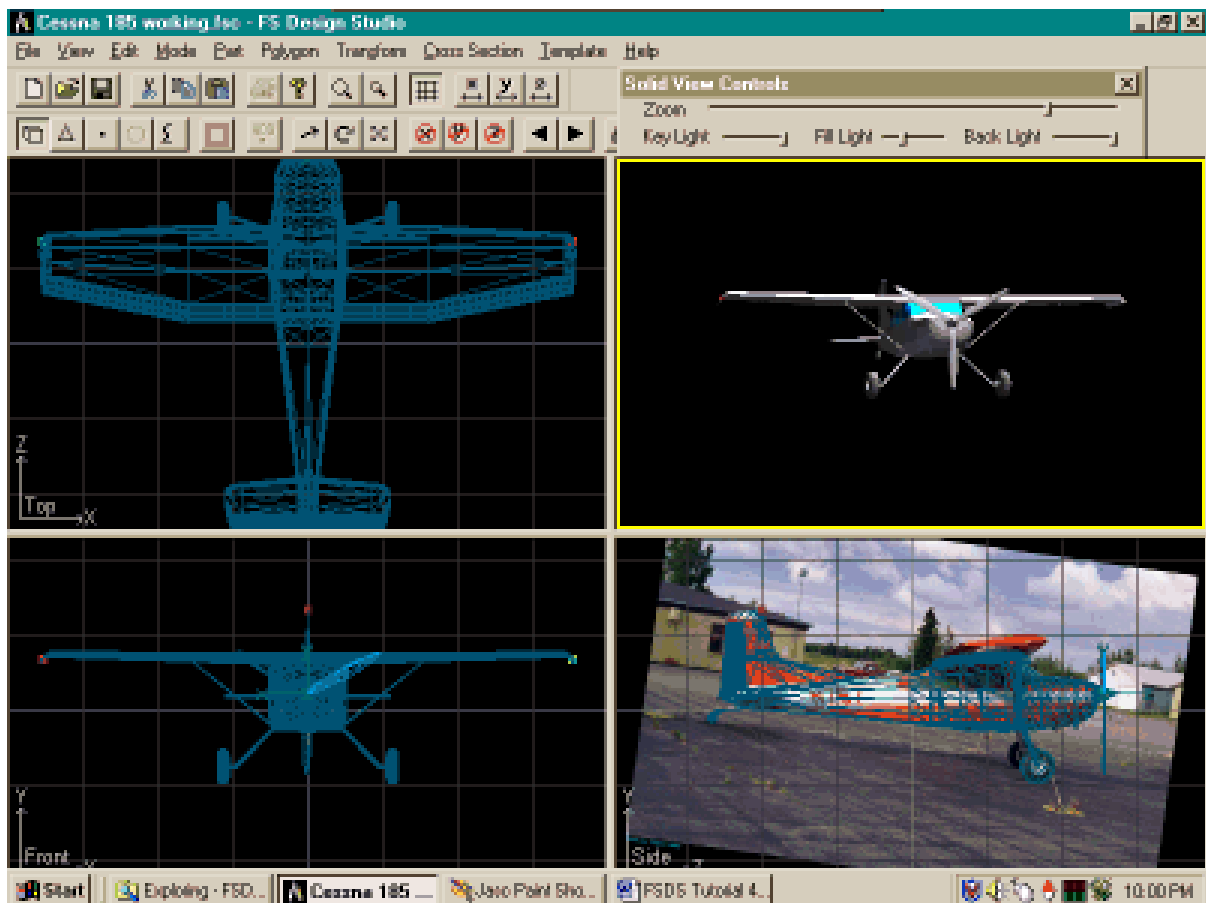
Now let's add the prop circles that you see when the Prop is spinning. This will be a transparent disk set to an opa[...] level of 3. Select Part, Add Polygon, set the radius as 5 and the perpendicular axis as Z. Then move into position where it will plane with the blades. Right click, select presets and set it as AA Porp1. Set the color to white, opacit[...] 3 name it Prop Disk F and save it. To texture this prop circle you can make a filled circle with opaque color. You ca[...] add a circular line to it to match any detail you add to the prop itself. When you select your texture, you will have [...] set the opacity to 3 as well. Experiment with textures and opacity levels to see what works best for you.
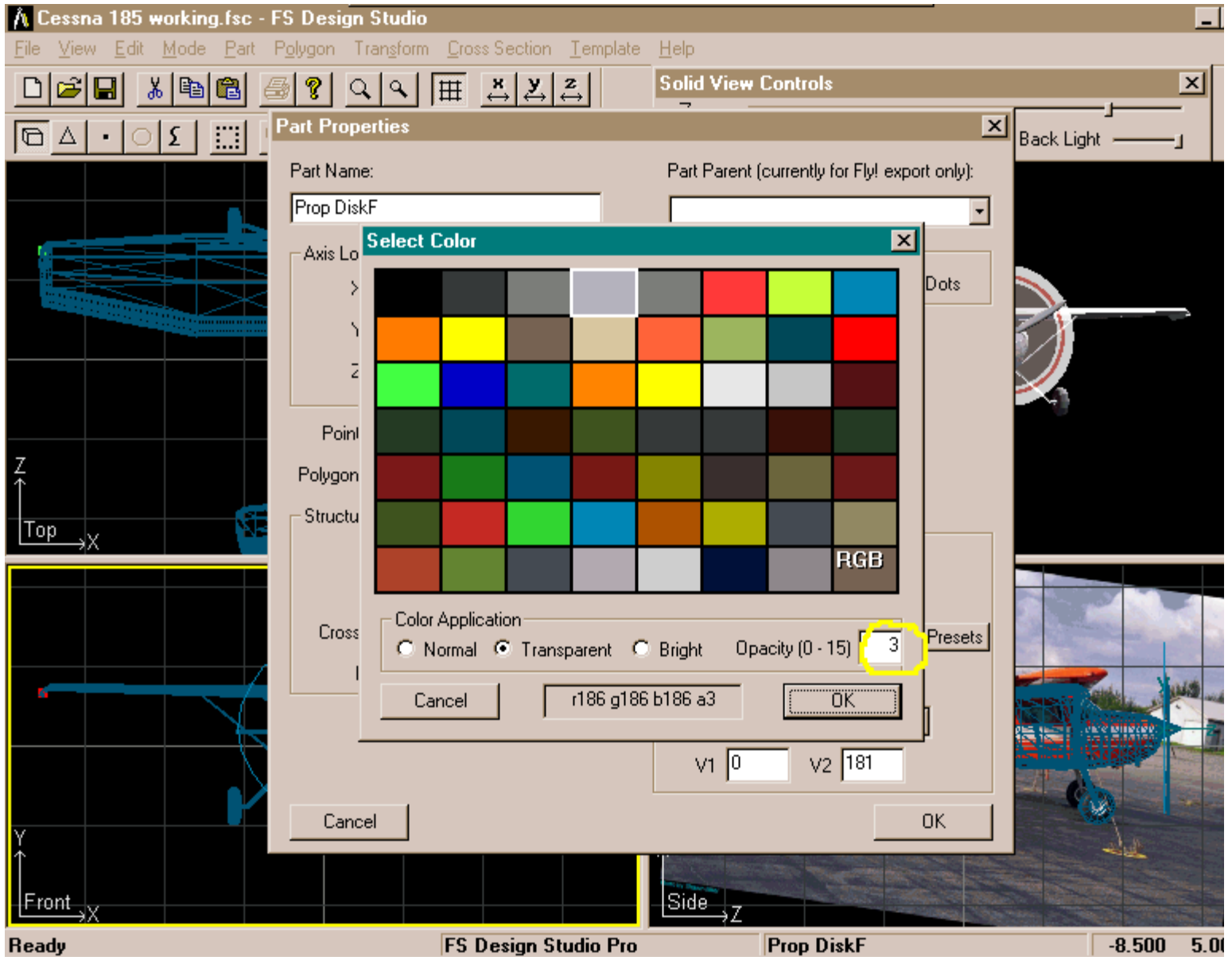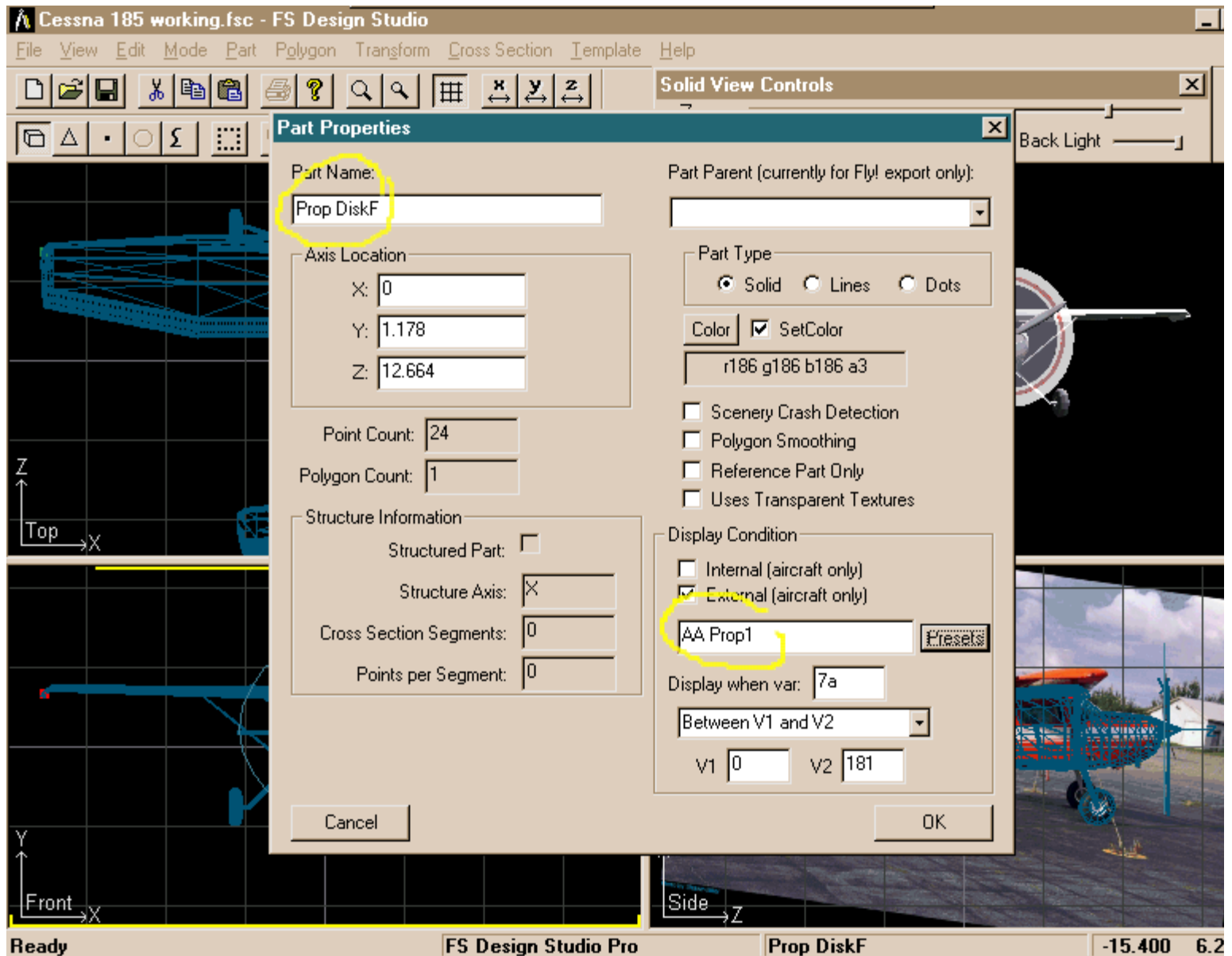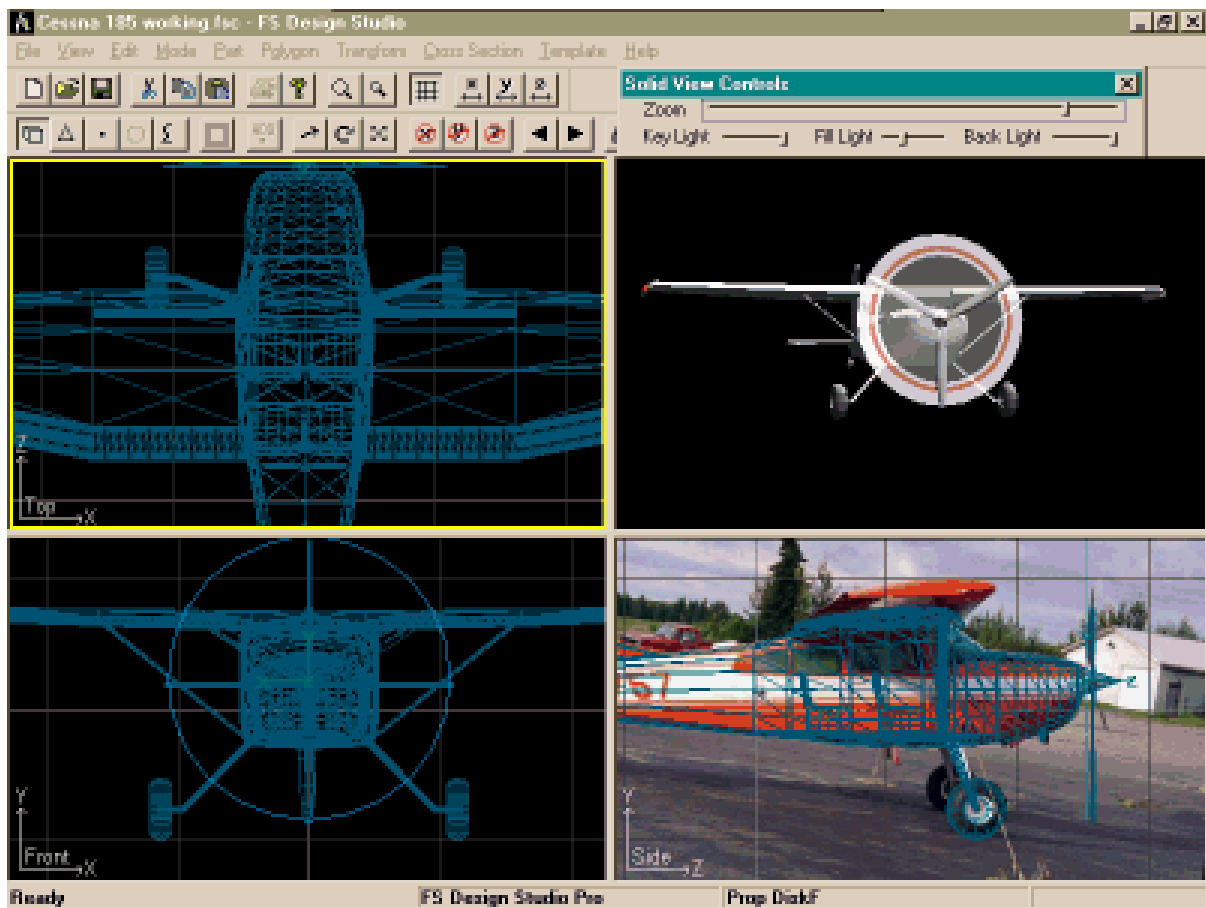
Now press Ctl "C" and Ctl "V" to copy and paste this part. Select Polygon Mode and press "F" to flip the polygon s visual flag is pointing to the rear. Name this part Prop Disk R and save it.

 Texturing with FSDS is rather easy to accomplish. Make a bitmap or .bmp 256x256, 512x512 or 1024x1024 and begin painting. I use Paint Shop Pro and set the color depth to 16 million to edit. This allows you to use things like layers and anti-alias to make edges of lines blend into different colors better. Make sure you convert them back t 256 colors before saving them and use short names with no spaces (DOS rules). To apply the textures you just ri click when a part is either "current" or "selected" and select Texture. You'll see the texture mapping menu that all you to apply a texture to any surface or by wrapping it around an axis. The help files have a nice tutorial about th What you will do is select an area of the texture by dragging the cursor over it and a box will appear. You can fine tune the placement of the box by adjusting the coordinates.

 At this point we have everything we need to prepare for production of our aircraft. You will first have to set refere points for the View Center, Center of Gravity, Wheel Placement or Footprint and Scrape Points.

We can do this in FSDS or we can do this by editing the .air file with FDE (Flight Dynamics Editor). Editing .air file no easy task and needs careful study. I suggest you open some .air files and look carefully at them. You can get information over the Internet about some of the unknown values in the control file. One way to begin is by using known aircraft that's similar to yours in weight, power, speed and basic handling characteristics. Then make adjustments to the .air file until you have acceptable flight dynamics. Many designers go to great lengths to find information about their aircraft and fine tune their .air files so don't steal other's work as your own. Be sure you c the original author if the information is available.

 If you choose to start from scratch FSDS will help set all the above reference points. Begin by selecting Part, Add selecting a sphere, conventional.
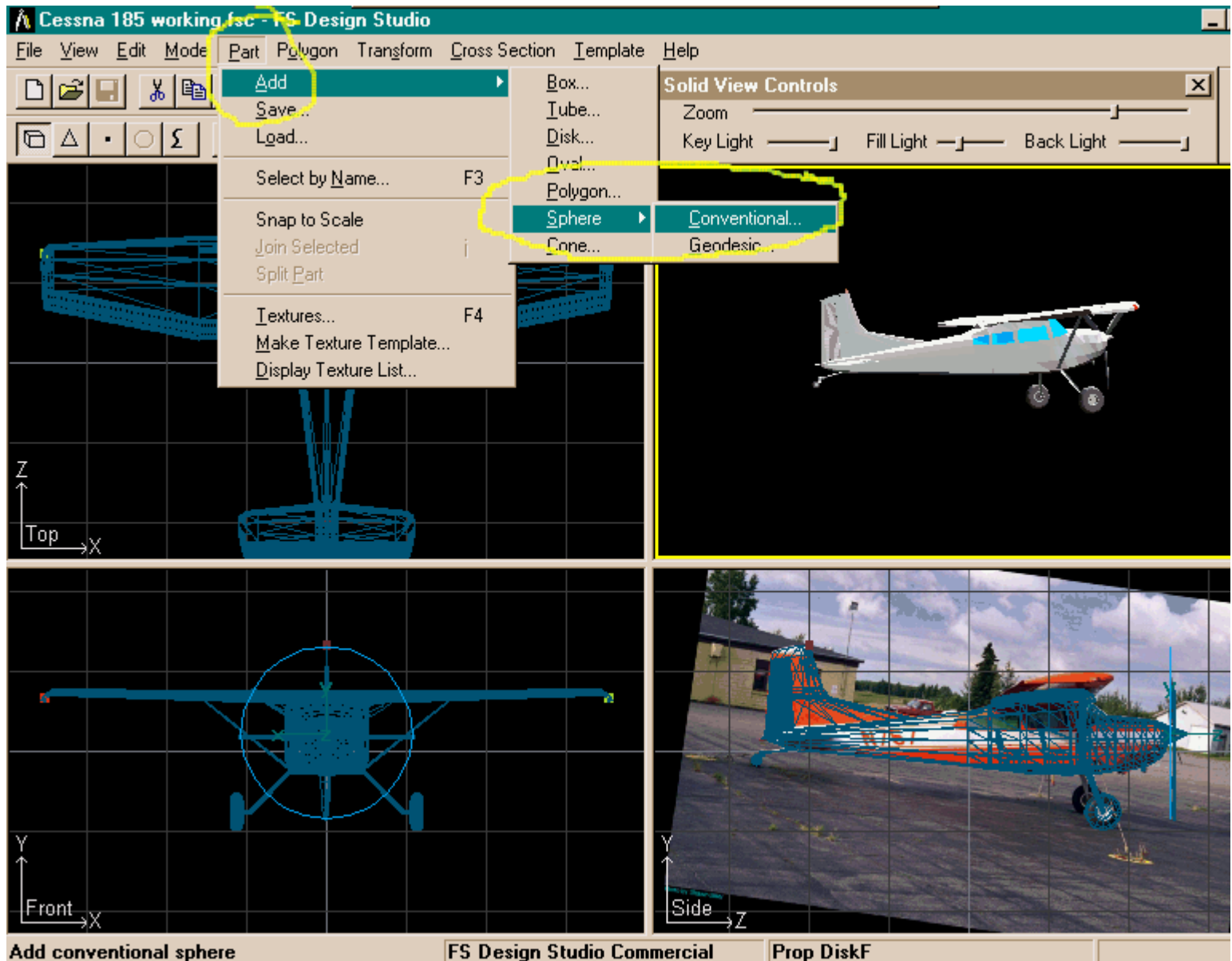
 Then select Move mode and move the sphere to where the pilot's head should be. This will be our Pilot's center o
view rotation reference point. If you'd like to use this as the pilot you can by scaling it down to the desired size a
texturing it with your own face if you like. All this is explained in detail in the help files under Definitions/ see Glos
then find the section under Create Aircraft. Once it's moved into place, you'll right click on the window and select
Current Item Properties make it a reference point only and name Pilot.View then save it by selecting Part, Save fr
the menu and name it Pilot View.
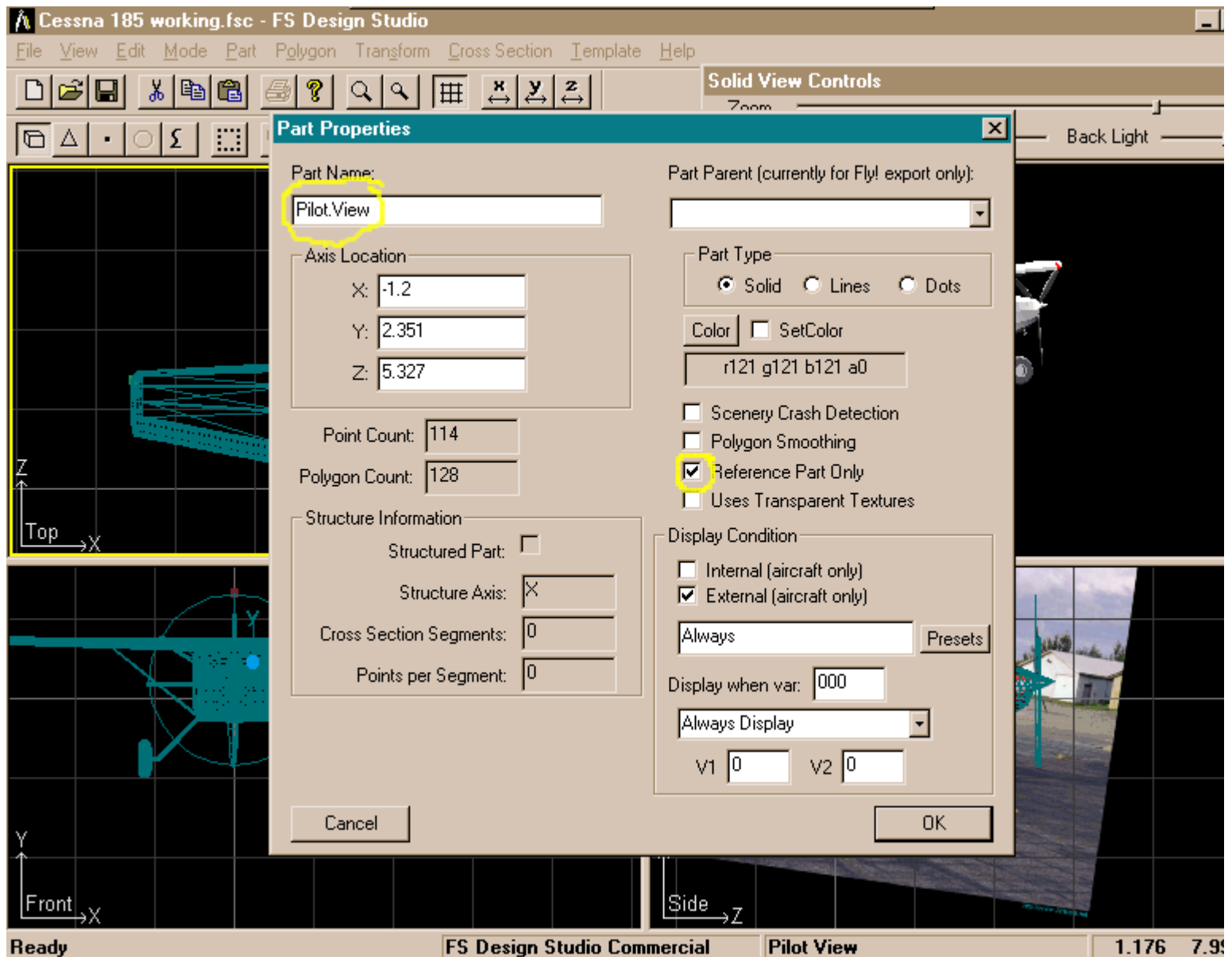
Now select Part, Add, Polygon make it .5 radius and 3 sides perpendicular axis Y. Now move it to where it just tou the bottom of the rear wheel where it would tough the ground.
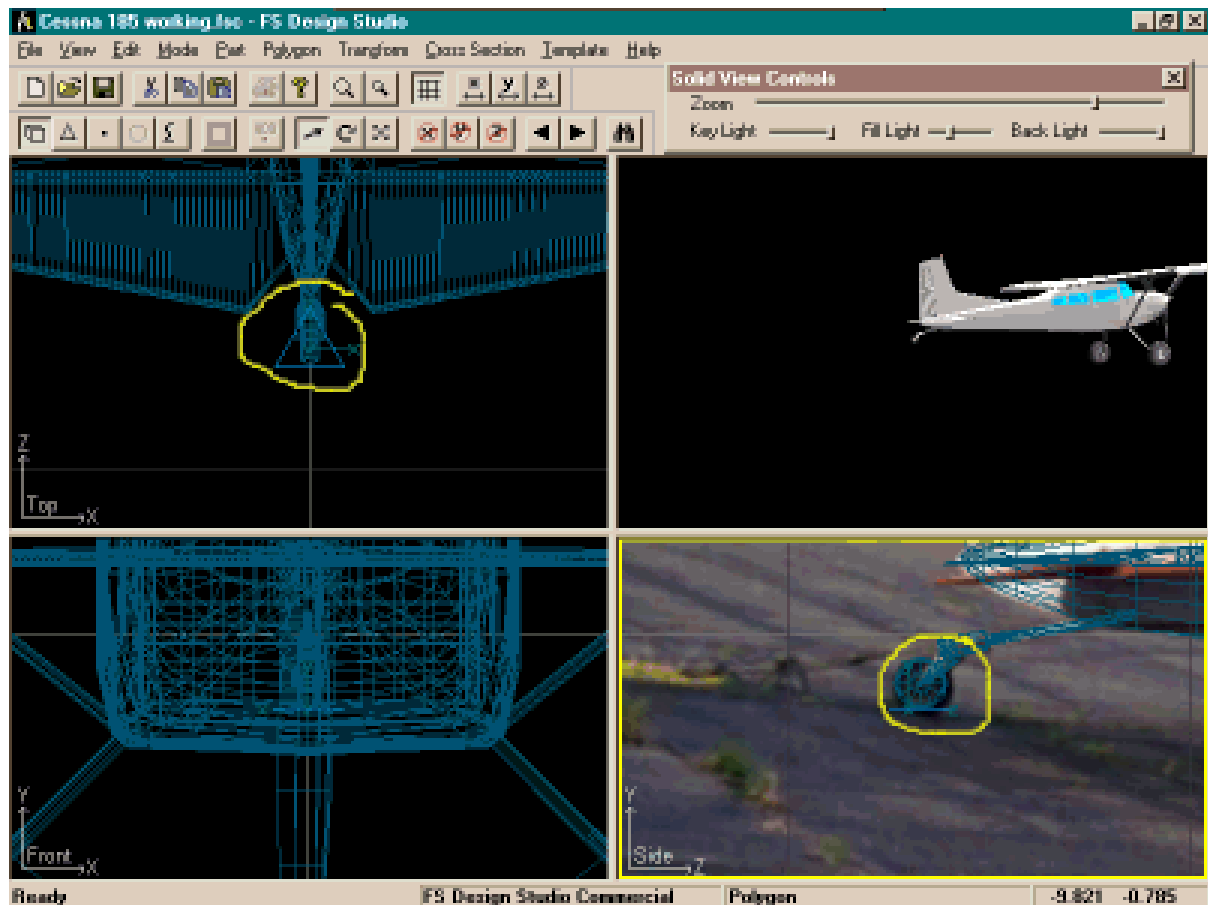
Right Click select Current Item Properties make it a reference only part, name it Gear.Center. Then select Part, Sa
and save it as Gear Center.
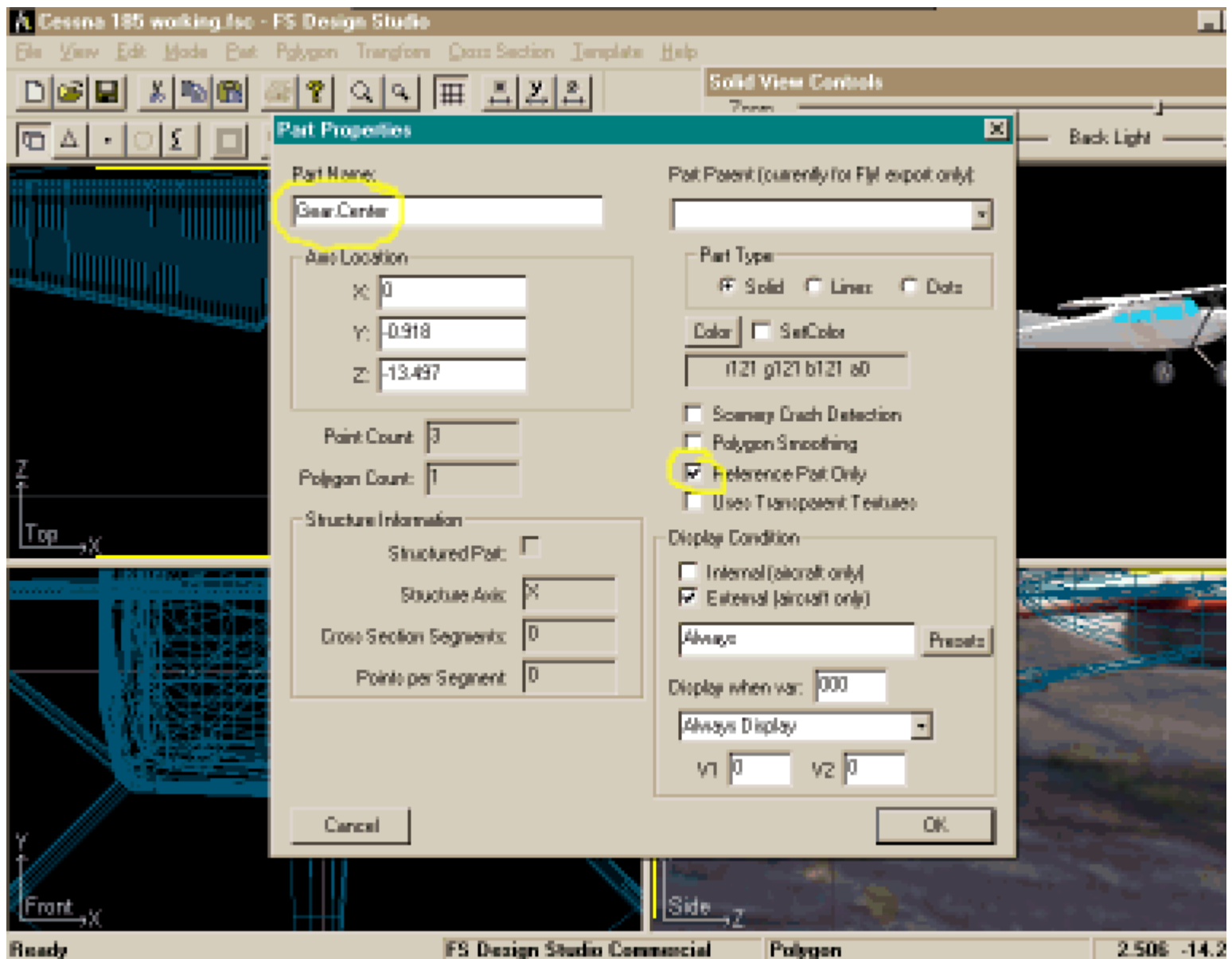
Now do the same for the Left and Right Gear except name them respectively Gear.Left and Gear.Right. Next we'll
Polygons for the Scrape points and name them Scrape.Front, Scrape.Side and Scrape.Rear. Place the front Scrape
Point at the tip of the lower Prop. Place the side Scrape Points at the wingtips and the rear Scrape Point below the
rear wheel. Now Select Part Mode press "A" to select all and select Move Mode. Drag the plane so the Center of
Gravity is below the center of the main wing, just above the floor of the fuselage. The Center of Gravity in FSDS is
the 0 X, 0 Y, and 0 Z origin.
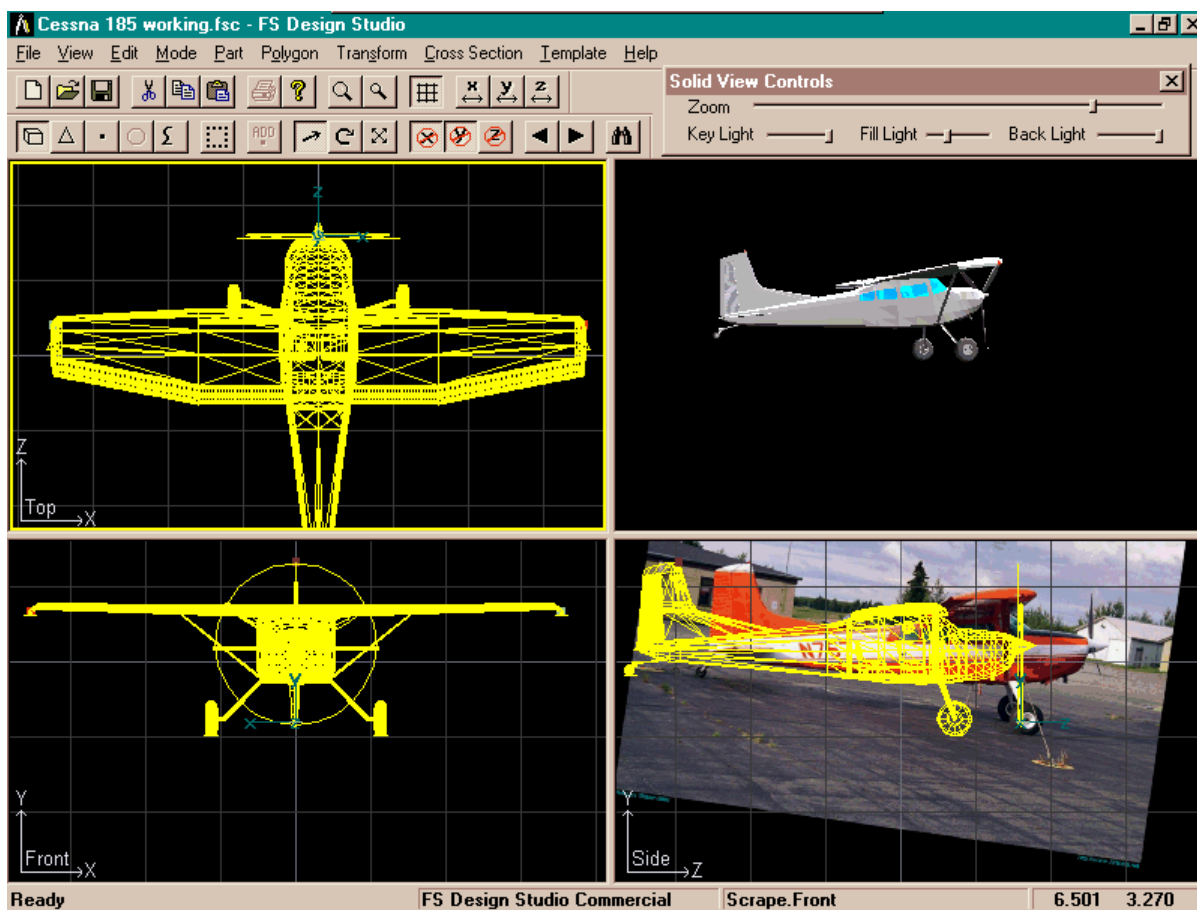
Now save your Project file. Congratulations!!! You have just finished your first plane. The only thing left to do is produce it in FS2000 and test fly it. Select File, Create FS Object File, Aircraft File (.mdl).
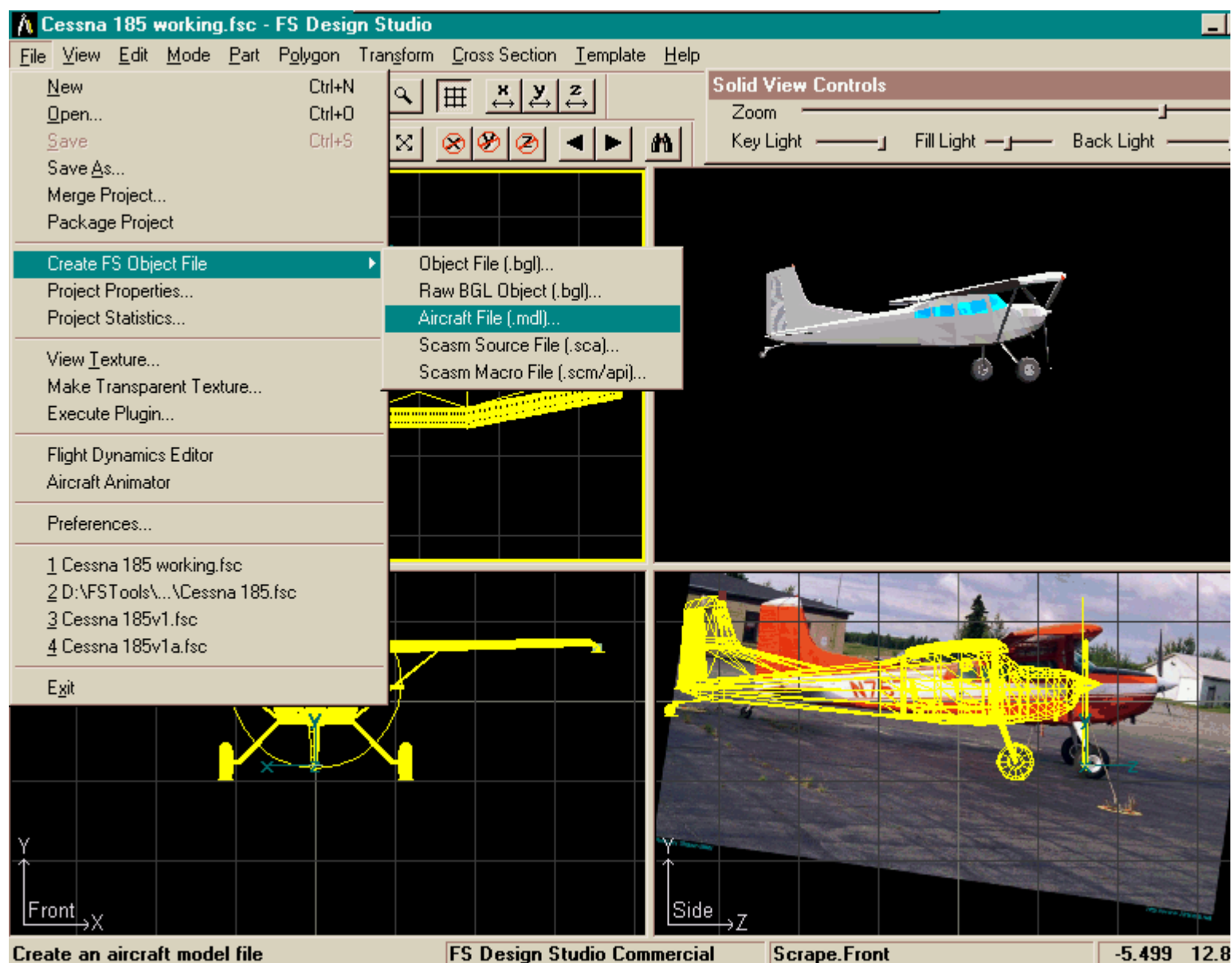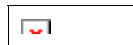
Here's how mine came out. Compare it with the backdrop.

From here you can add textures and adjust Flight Dynamics using the FDE. If you find that you'd like to make cha
to any part, you can select them easily by selecting Part, Select by Name and choosing it from the list. You can se
it or make it the current part so you can edit it. By now you have all the skills necessary to make almost any aircr
Be creative and try new ways to edit parts, for instance you can make polygons from points to patch any "pinhole
split a part to add points to make things like the cooling vents below the cowling. You are only limited by your
imagination. It's been a pleasure helping you and I hope to fly your finished product. Good Luck!!!

Here are some useful places to find information and get answers to questions on the Internet. You'll get answers f
Louis Sinclair, the designer of this fine program, thanks Louis!! There will be other designers, Konstantin Kukushk
the author of Aircraft Animator as well as myself from time to time.

Part 3

Other Links for FS Design Studio information

http://www.abacuspub.com

http://www.freeflightdesign.com

http://fsdesignstudio.com

http://exo.com/~gregoryp/cfs/squawks/config.cgi

http://www.flightsim.com

http://www.avsim.com

http://www.simflight.com