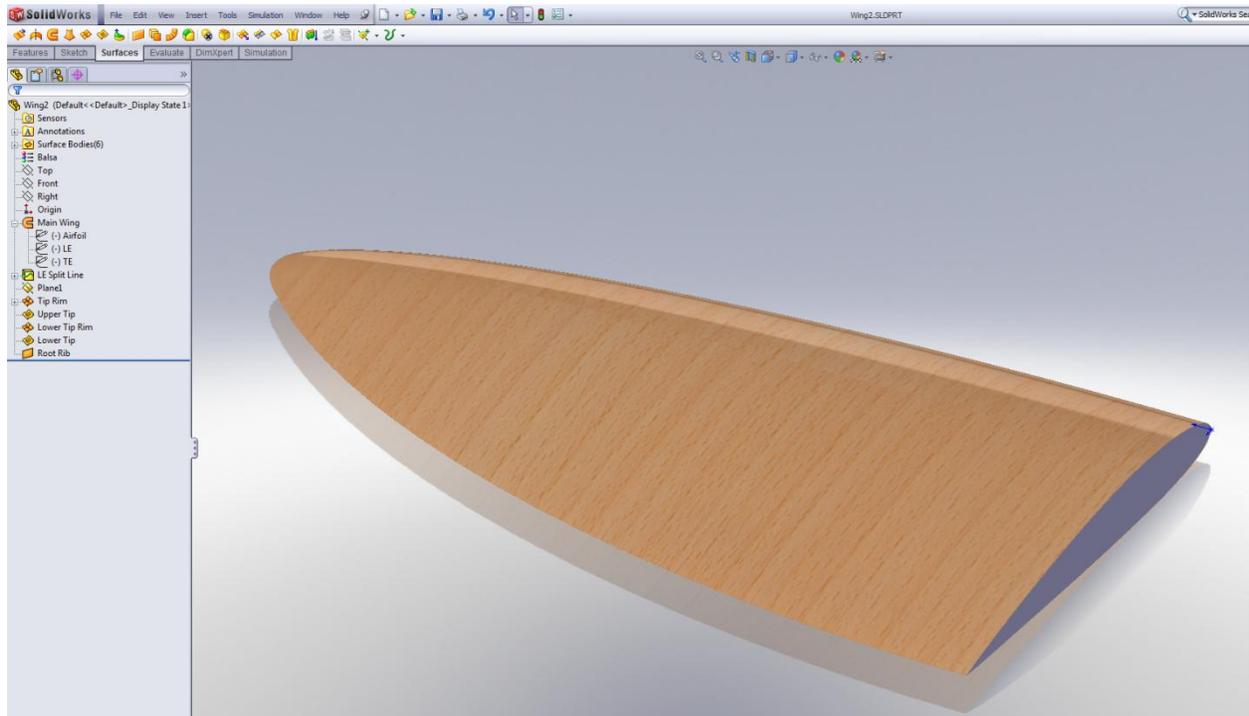


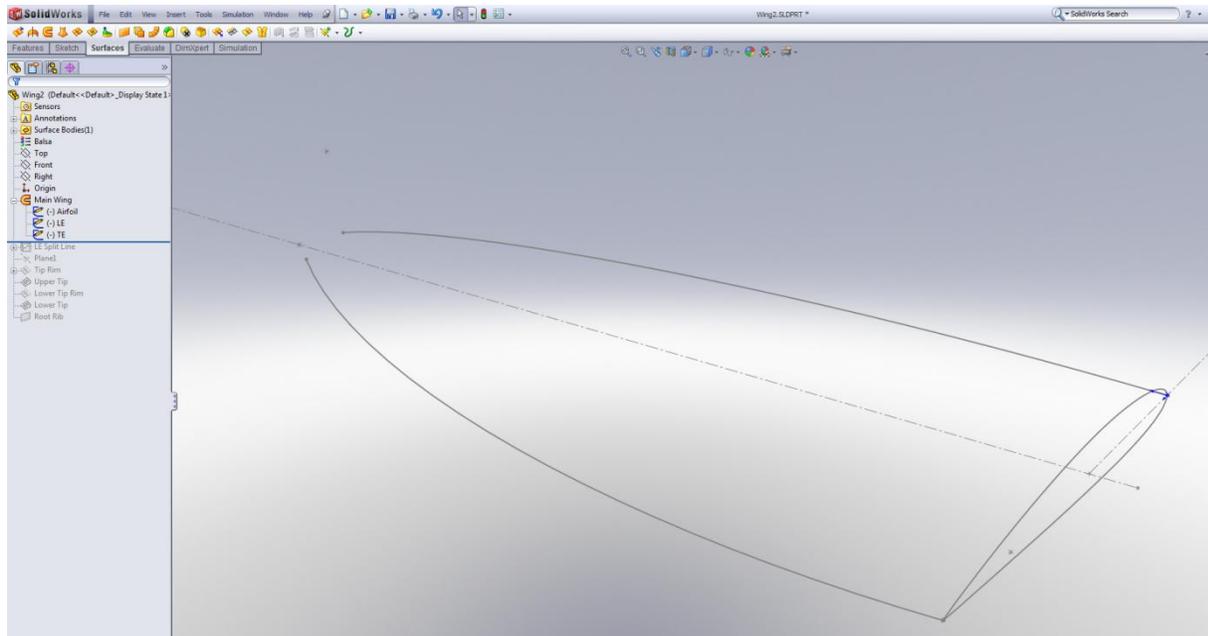
## CREATING WING TIPS IN SOLIDWORKS

I had a request to describe a method for making Wing tips/Nose Cones in Solidworks. I've always had a little trouble with these features, so the following procedure is my best "stumble around" approach to the problem. (I'm sure there are many better ways to accomplish the same result, and I hope some of you who know how to do it well will share them with me...)

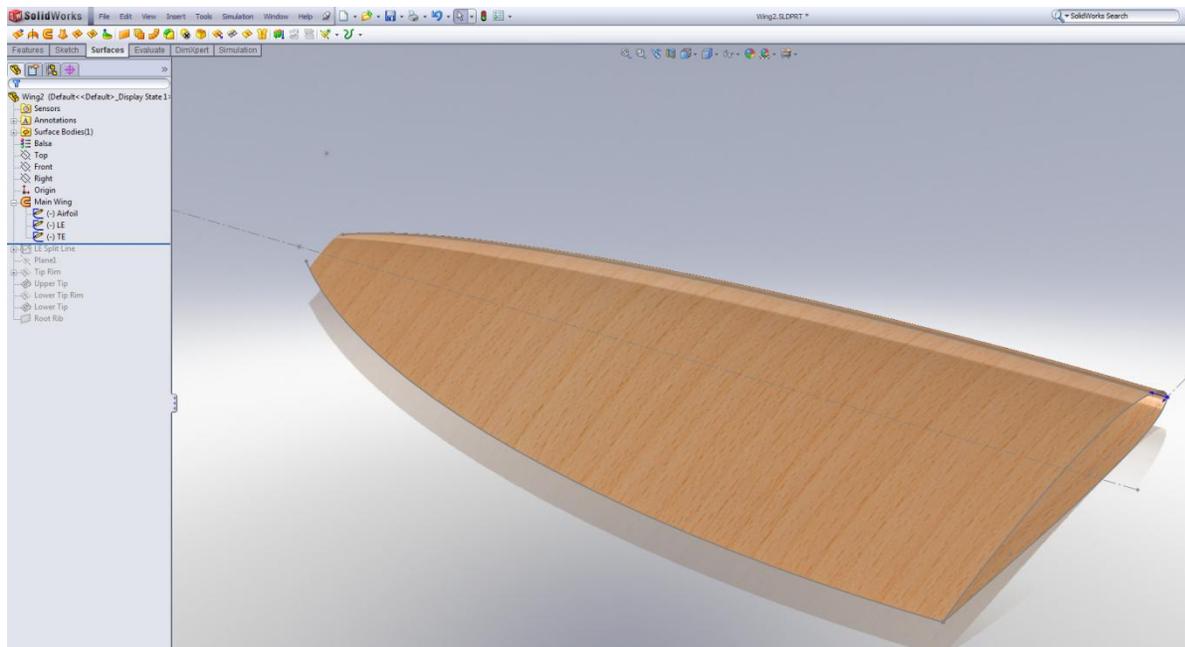
We'll start with a view of the complete wing. It's a NACA 2412 airfoil, with elliptical Leading and Trailing Edges:



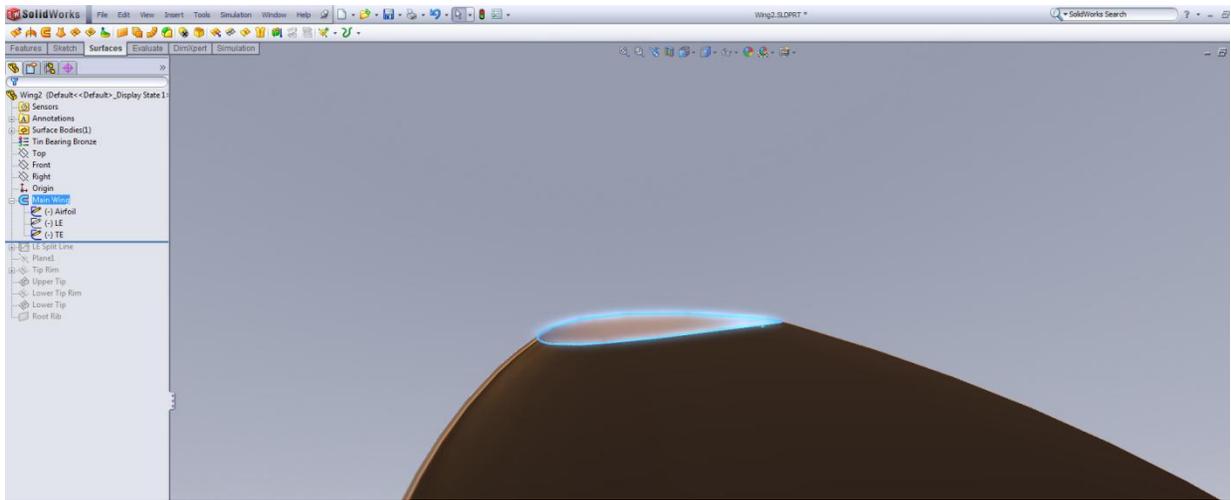
The main wing Loft section and guide curves:



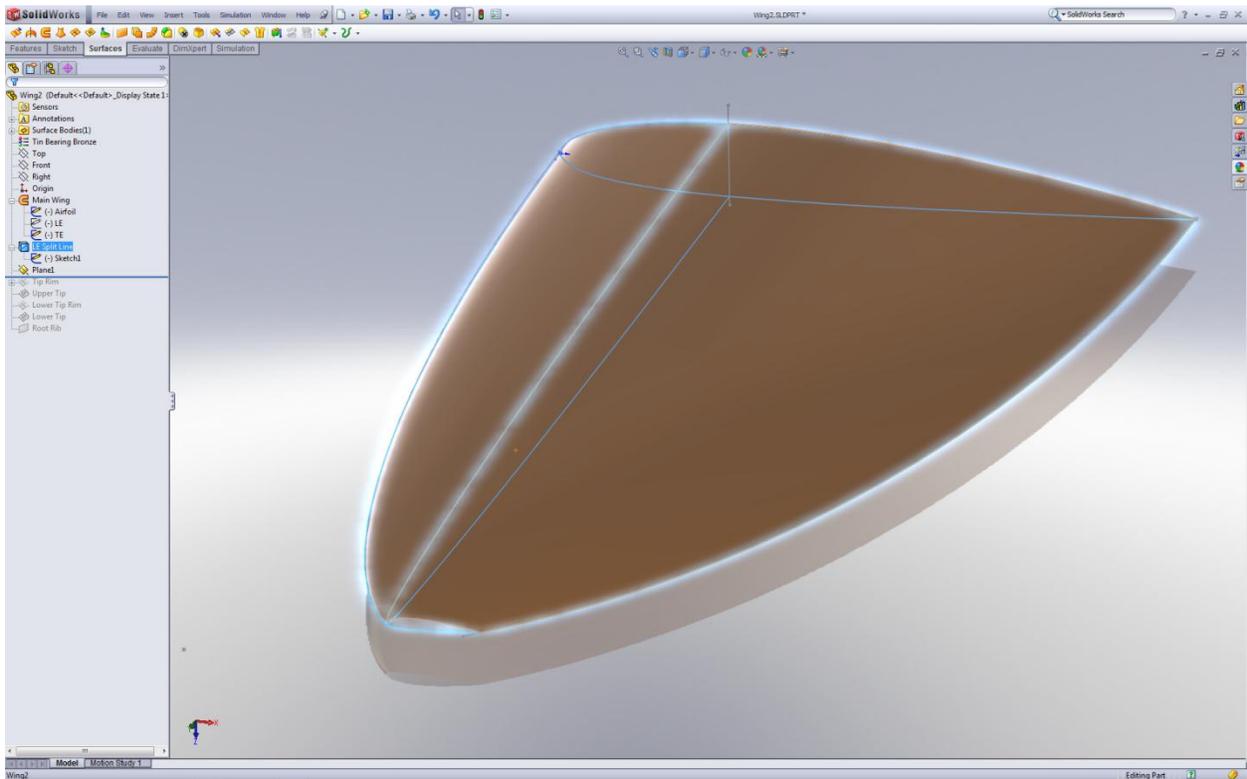
Main Wing Surface Loft:



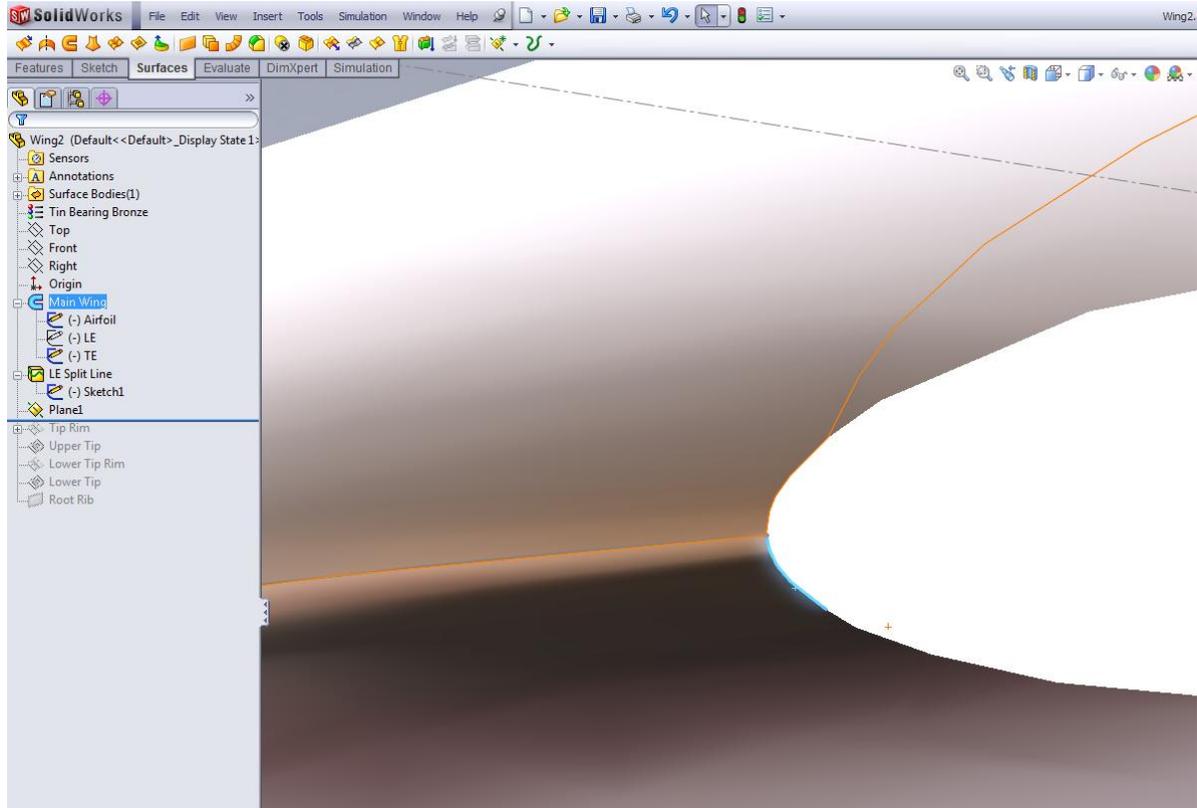
The tip area of the Main Wing Loft, viewed from below:



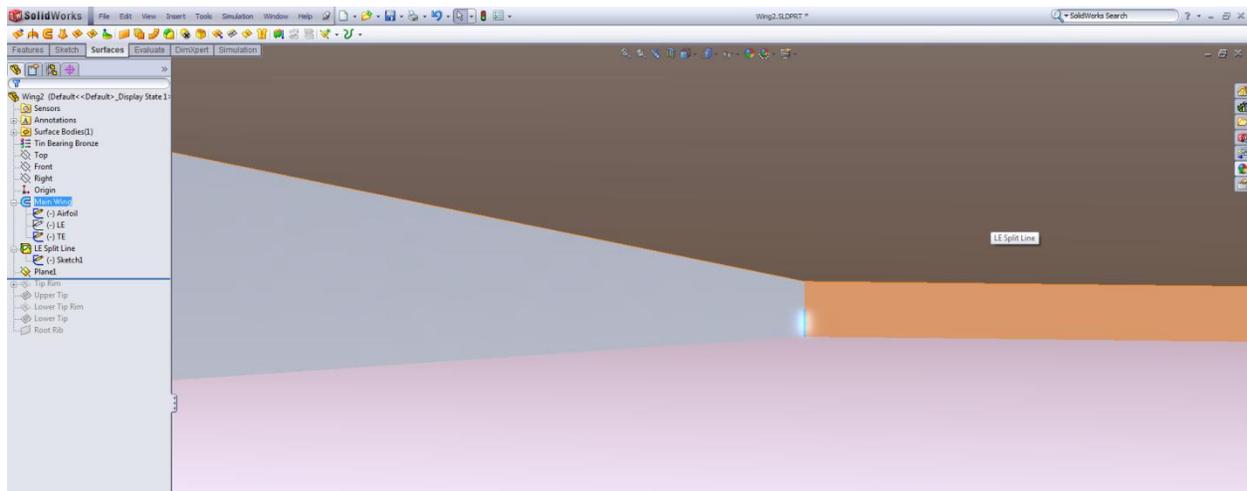
Now, a Split line is added to both upper and lower surfaces:



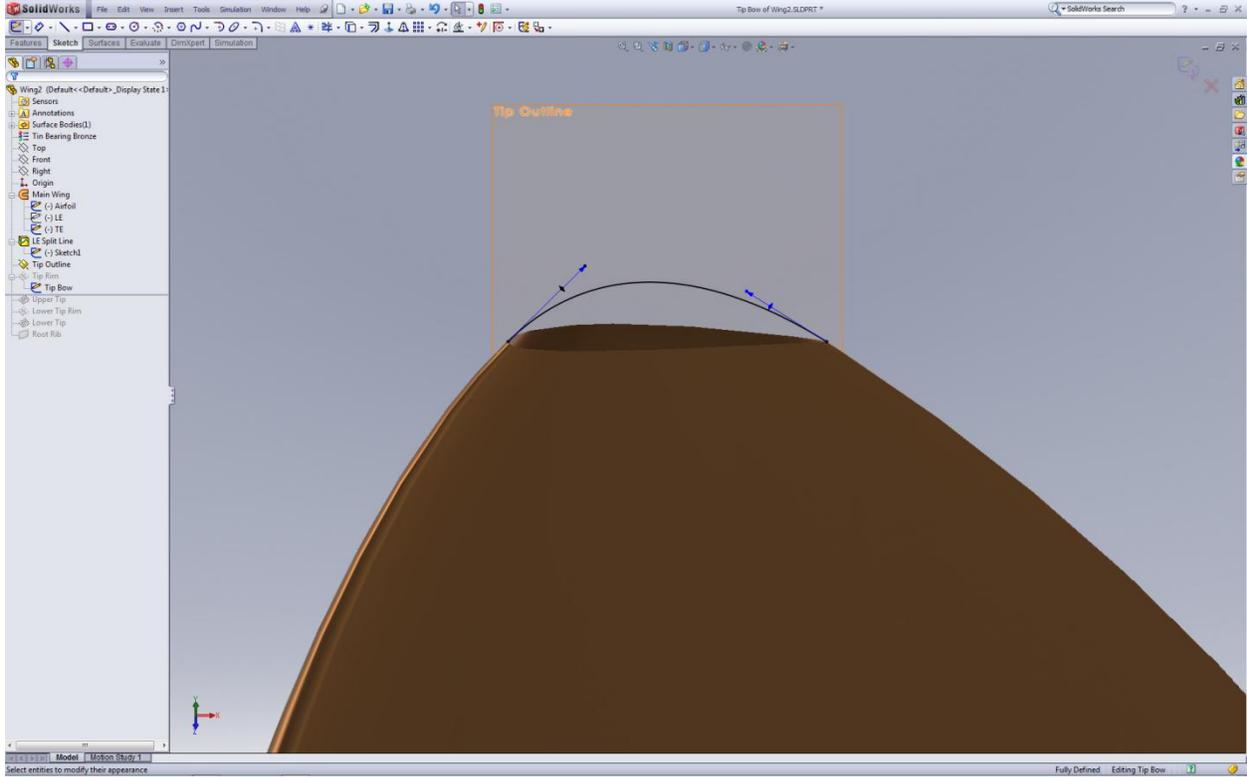
This Split line divides the LE portion of the tip contour into two parts (the lower is shown below highlighted in blue), which will help keep the tip surfaces well behaved:



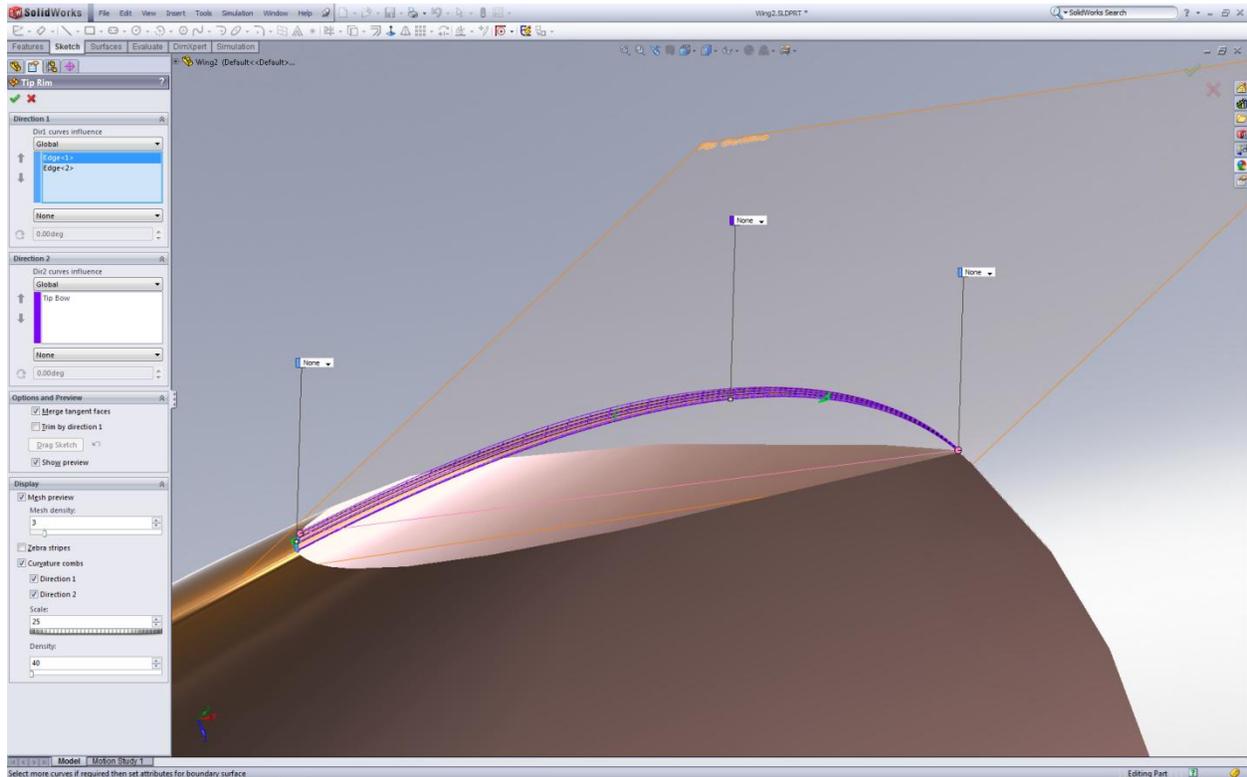
The trailing edge also has a split in it (lower section in blue below) from the initial airfoil sketch. I almost never loft airfoils with a sharp trailing edge. (I can't fabricate a "sharp" corner because my CNC doesn't have an infinitely sharp cutter, and CAD lofts don't much like singularities):



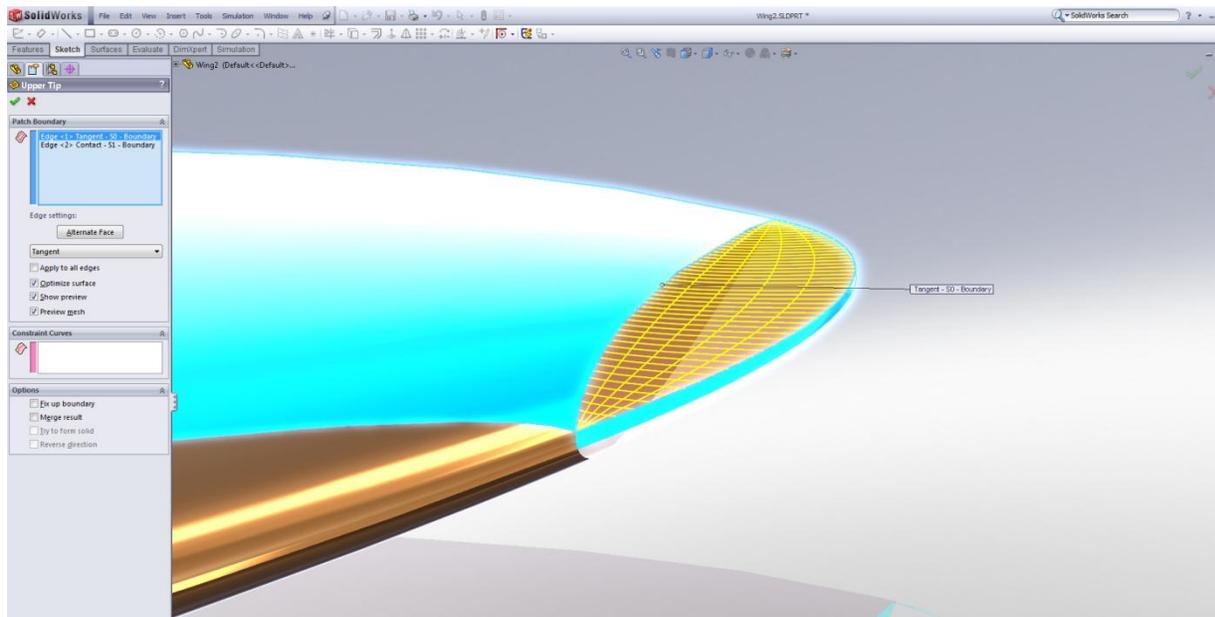
Now, we define a plane on the midpoint of the T.E. and L.E., and define the tip outline with a two point spline tangent to the L.E. and T.E.



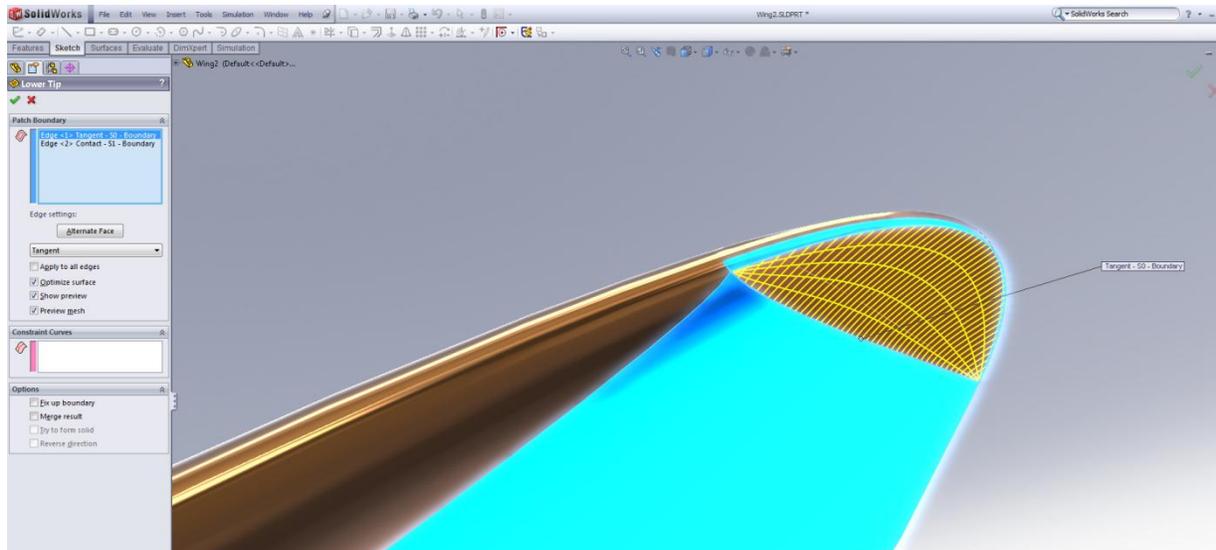
Now we're almost done. We have everything necessary to create the tip surfaces. First, we use a Boundary Surface for the upper "Tip Bow":



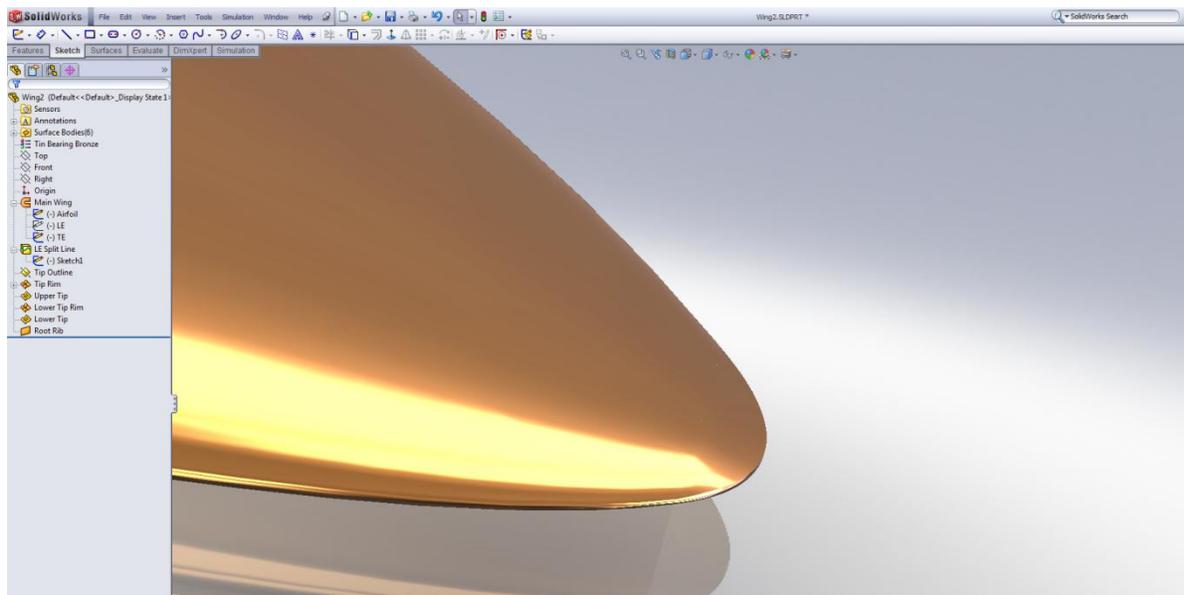
This curve connects the upper segment of the T.E. to Upper Nose section on the Main Wing. Now, we put a Surface Patch between the Tip Bow and the Main Wing:



We repeat the process for the lower Tip Bow and lower surface patch:



And now we have a wing tip:



A few points about surfacing for real parts (i.e. parts that need to be better defined than just making a conceptual shape):

1. Since SW surface are bi directional (i.e., UV directions), they behave best when they are 4 sided. Obviously, you can make lots of multi sided surfaces (particularly with the Boundary Surface) without encountering any difficulty, but if you can, define the edges in such a way that you have four sides...
2. Avoid intersections (corners) where there is a high degree of curvature between the edges that you are trying use for surface creation. (This is the reason for the splitting of the Leading edge and the creations of the "Tip Bow" surfaces).
3. Keep the base features as "clean" as possible – don't have a lot little curves when a single one will do (this is sometimes a problem with imported geometry. Often these entities have multiple small curves with different slopes, and lofting these can be problematic...
4. For Swept Surfaces, make sure that the Profile Sketch is correctly constrained to allow it to change in the manner you desire as it sweeps along the path (I think this is the biggest cause of Sweeps not behaving in the way we expect). Remember, some entities in the Profile have to be allowed to grow/shrink as it tries to follow the path and guide curve(s).

Again, all of the above are only my thoughts and opinions. I'd love to be informed of better ways to use the Solidworks software...

S. Fahrner

6/18/2010