

A-380 Buildup

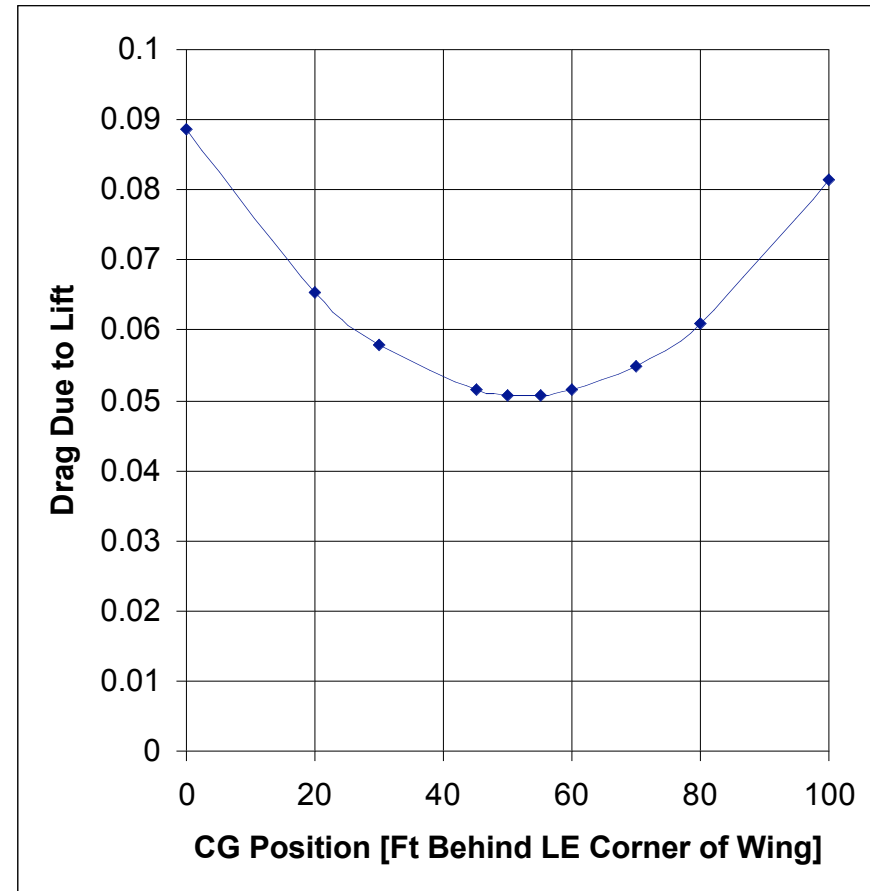
Charles Walston

Elliott Cavett

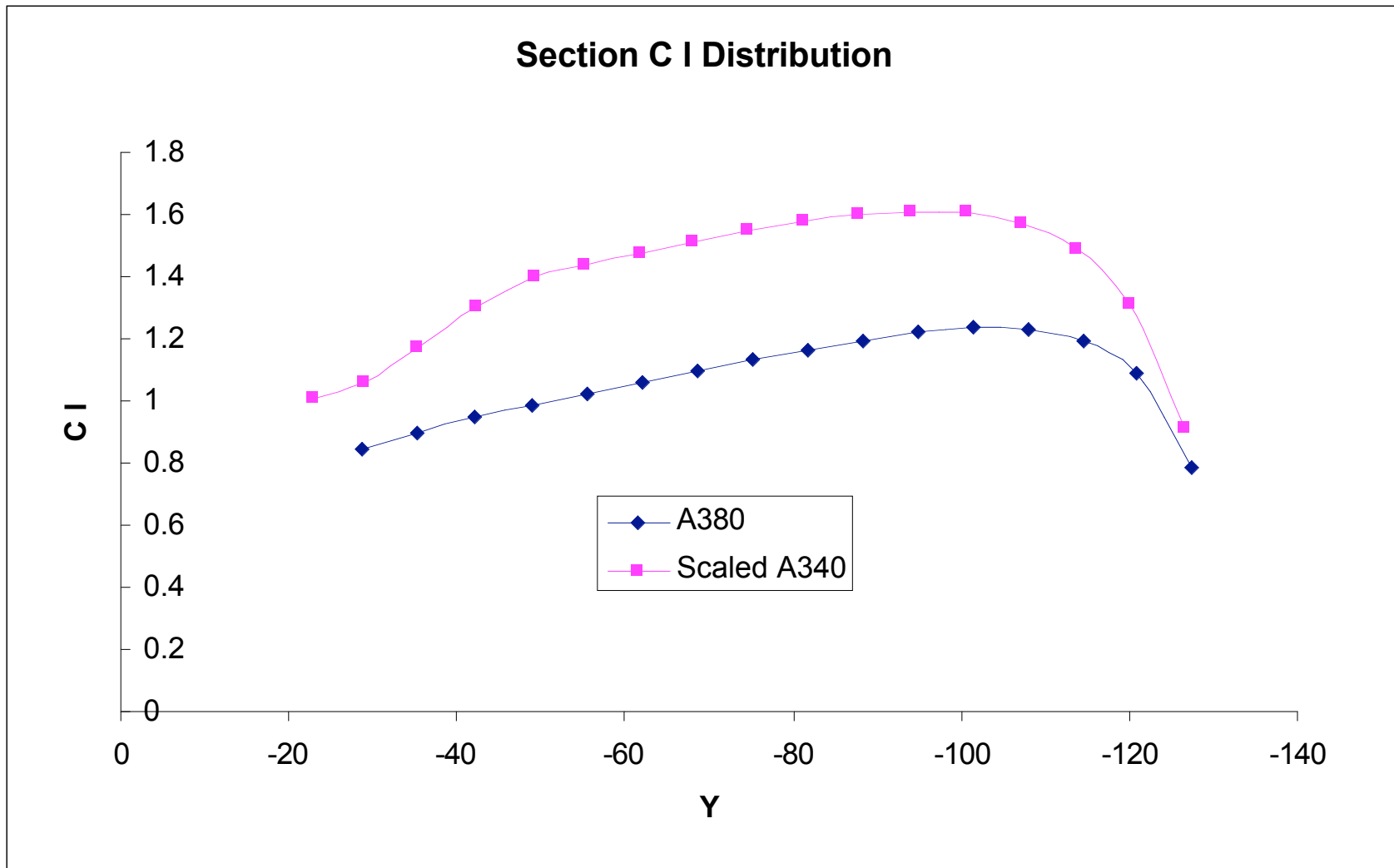
Tim Streett

Min Drag CG Location

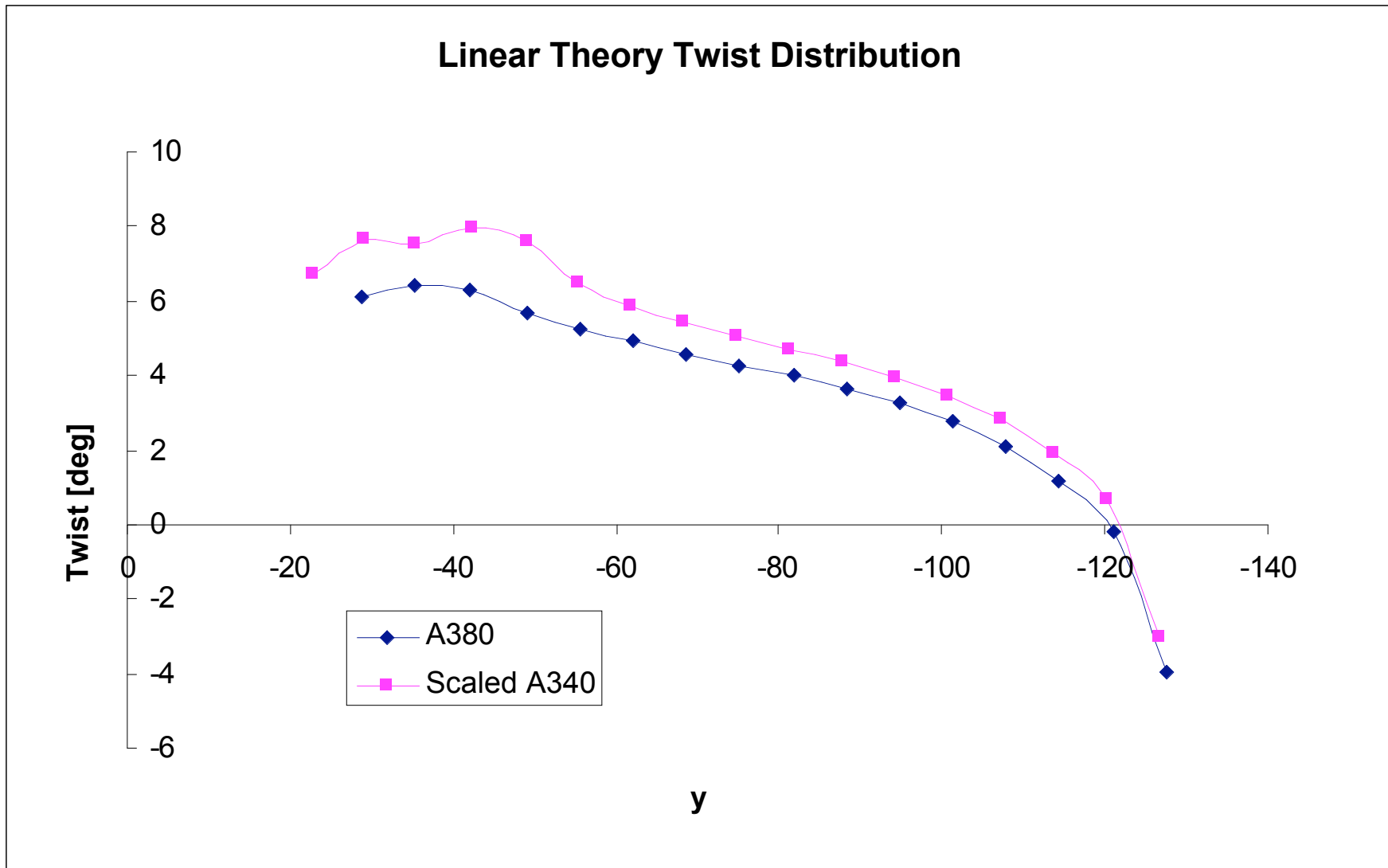
- CG Location for min C_{Di} : 115 ft aft of Nose
 - Static Margin: 17 ft
- Estimated position: 125 ft aft of Nose
 - Static Margin: 27 ft
- $E = 1.0099$



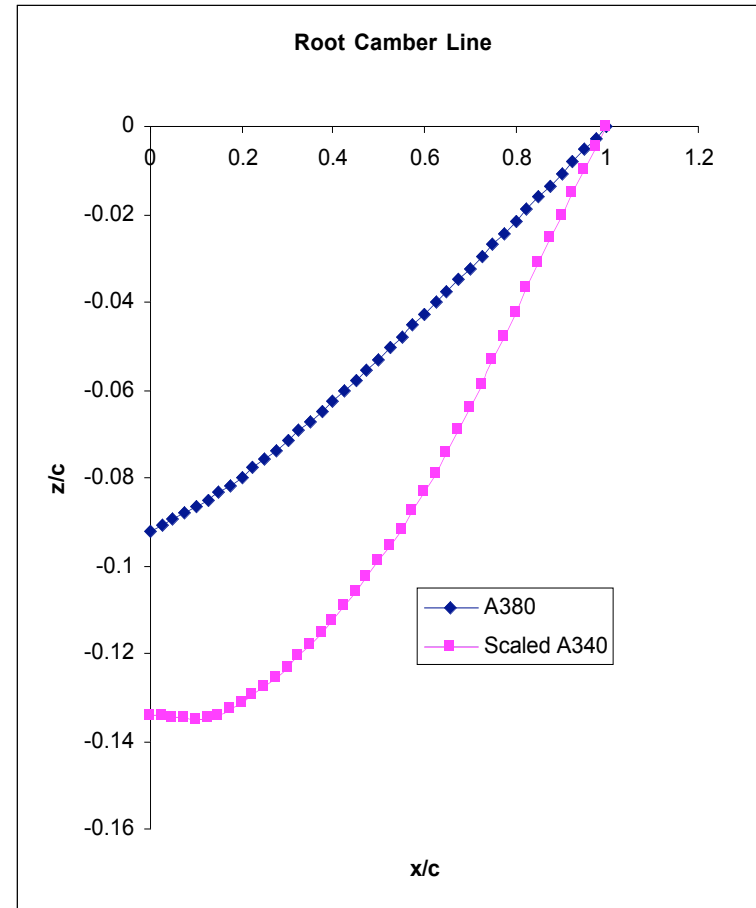
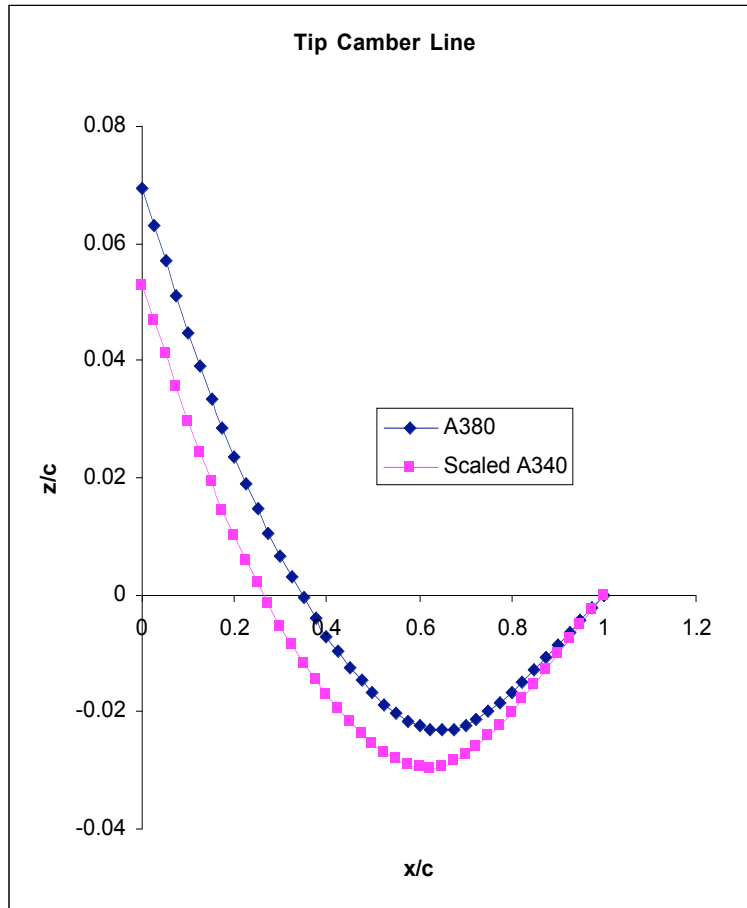
C_L Distribution



Twist Distribution



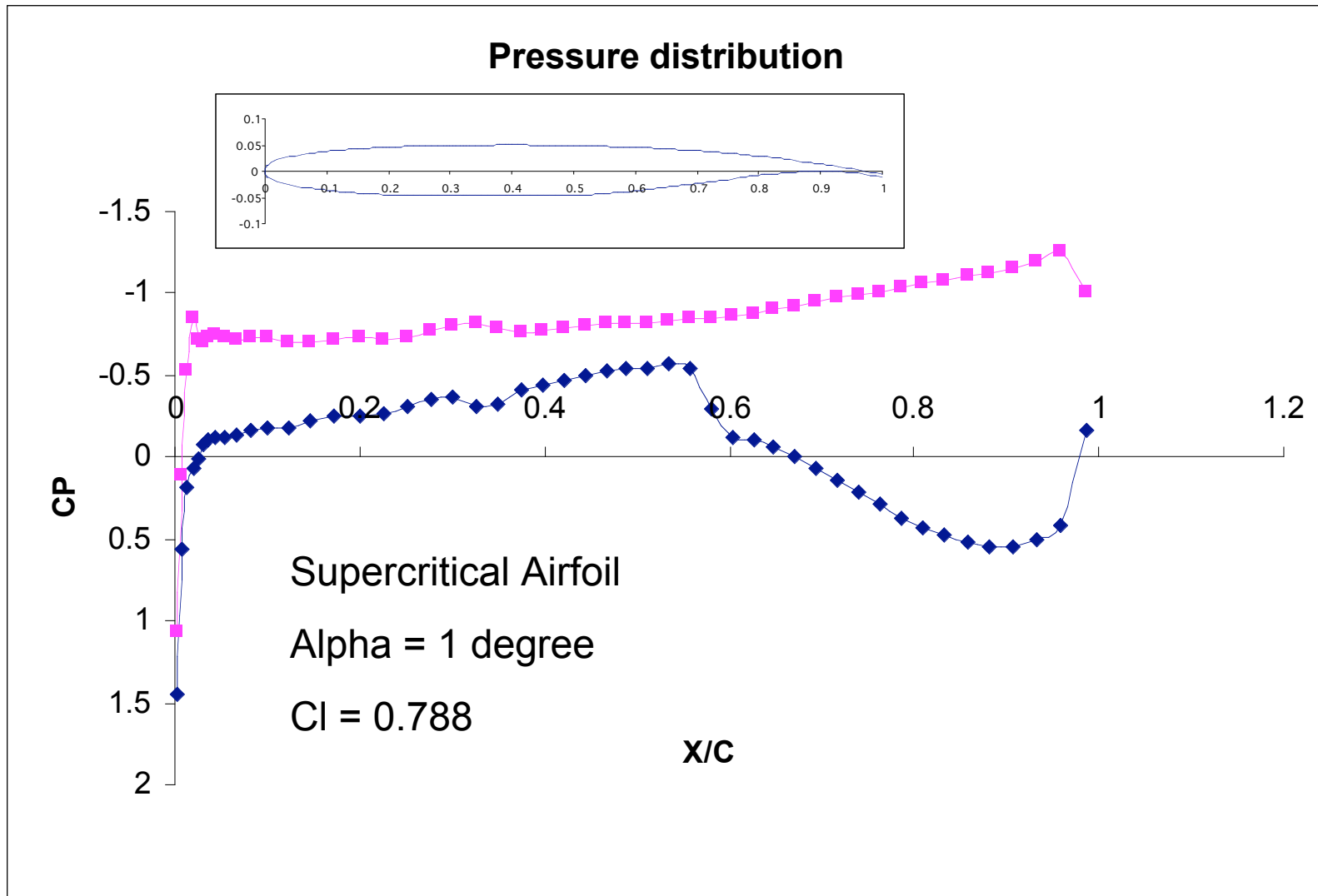
Root & Tip Camber Lines



Notes on Min Drag, CL, Twist and Camber Plots

- Min Drag-
- Successive runs located the CG at 115 aft of the nose, about 10 ft off the estimate from the landing gear. The static margin we calculated was 17 ft, using an aerocenter calculated from VLMpc
- The CL distribution for both cases seems fairly standard
- Twist distribution is also fairly standard
 - No significant penalty for the A380 wing in these
- The camber lines for the scaled A340 seem more complex giving an advantage to the A380's design
- E for both planforms was just over 1
- The major difference in scaling the A340 wing up came in shifting the CG forward, which in practice is bad for takeoff and difficult to actually manage.

Airfoil Design



Notes on Airfoil design

- The design started with a supercritical airfoil
- CL critical: ~ 1.2
- The CL was insufficient, but the airfoil solution diverged at alphas greater than 1.
- By increasing the LE radius slightly, the CL increased from ~ 0.6 to ~ 0.8
- All other modifications attempted diverged the solution
 - Modifying airfoils in TSFOIL is a royal pain
 - Each point must be changed manually
 - As such, we could not find a supercritical airfoil to produce the critical CL