AA200A Homework 6 2014 -2015

Due Tuesday May 19, 2015

Read: Chapter 11
Recommended Reading: Chapter 3 in *Wing Theory* by R. T. Jones

Problem 1 – Reproduce the results in section 11.2 for the flow around a Joukowsky airfoil. Using that airfoil or, if wish a Joukowsky airfoil based on your own choice of parameters, determine the lift coefficient for a range of angles of attack.

Select several angles of attack for more detailed study in the following two problems.

Problem 2 – Determine the thickness function and camber function for the Joukowsky wing you generated in problem 1. Use these functions to produce the thin airfoil approximation to this wing. Determine the thin airfoil pressure coefficient about the wing and compare to the pressure coefficient from Joukowsky theory. Determine the lift and moment coefficients of the wing based on thin airfoil theory.

Problem 3 – Now that you have defined a wing geometry with its pressure distribution determine the boundary layer characteristics on the wing.

1) Assume a laminar boundary layer and use Thwaites' method to determine the boundary layer characteristics on the upper and lower surfaces up to separation.

2) Assume a turbulent boundary layer and use Head's method to determine the boundary layer characteristics on the upper and lower surfaces up to separation. Determine the drag coefficient of the wing. Plot L/D versus angle of attack. You may wish to use a Thwaites calculation for laminar flow very near the wing leading edge to provide initial conditions for a Head's calculation over the rest of the wing.