MAE 424

Project 1

By: Syed Ali Hasan

Case 1: NACA 0012 airfoil using 10 panels

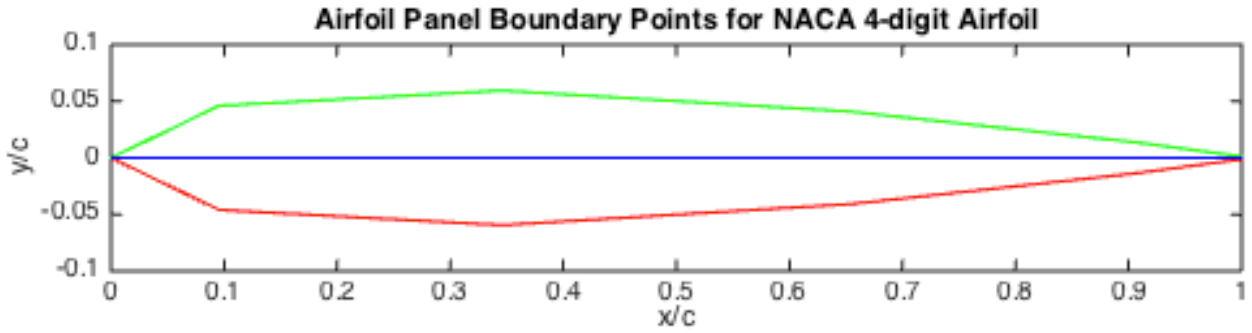


Figure 1: Panel Boundary Points for NACA 0012 airfoil using 10 panels

Case 2: NACA 2412 airfoil using 10 panels

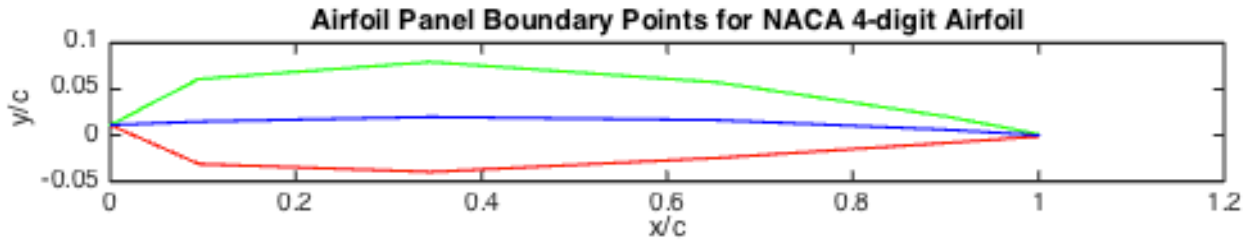


Figure 2: Panel Boundary Points for NACA 2412 airfoil using 10 panels

Case 3: NACA 2412 airfoil using 100 panels

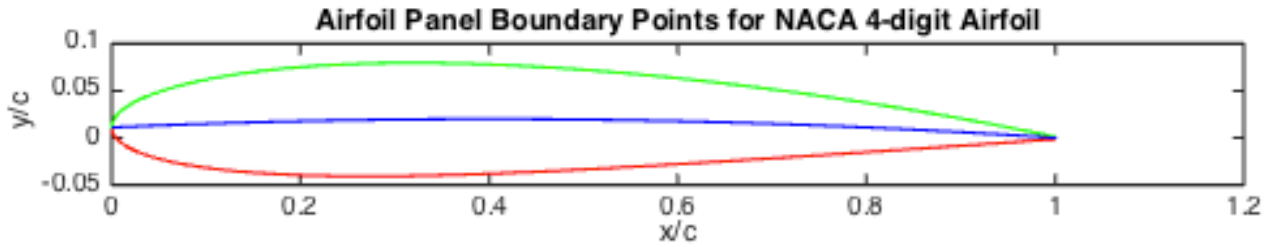
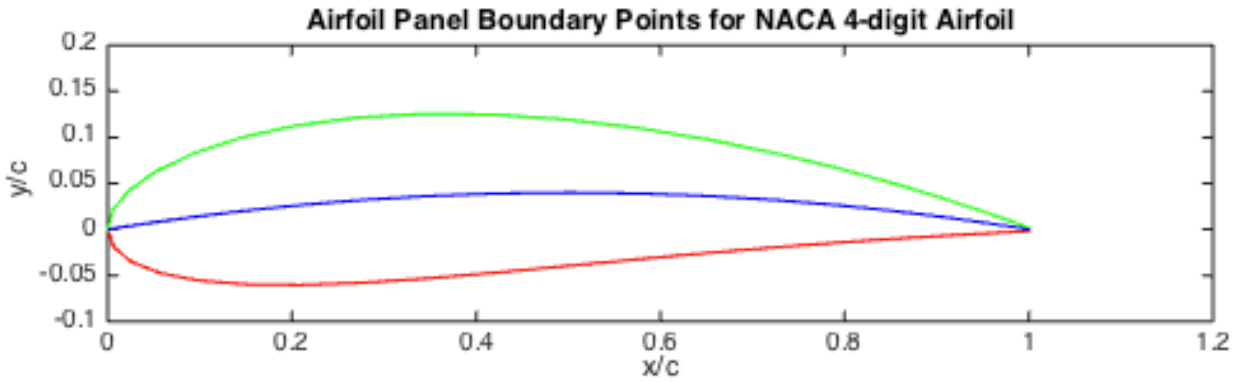


Figure 2: Panel Boundary Points for NACA 2412 airfoil using 100 panels

<u>Case 4:</u> NACA 4518 airfoil using 40 panels



<u>Questions:</u>

Q. What happens if you input an Np value that is too small?

When the Np value inputted is too small then the lower boundary and upper boundary of the airfoil shape is compressed onto an almost single line as there are too less points to determine a proper shape.

Q. What happens if you input an Np value that is an odd number? (This may depend on your code...)

The program still runs but provides warnings about the accuracy. The plot is distorted and the lower boundary and upper boundary of the airfoil shape and camber line are seen to overlap linearly to certain point from which they disperse into different directions. The program doesn't seem to be able to produce accurate results.

Q. Based on your experience in plotting these airfoil shapes, what is the minimum value of Np that captures the airfoil geometry best? (This is a subjective question, until we test our geometries with the vortex panel code—just give your best answer.)

Based on testing of the code using multiple different Np values it can be seen the when Np is 6 or higher, the plots seem to be accurate and generate proper boundaries.