FLUENT - Flow over an Airfoil- Problem 1

Problem 1

Consider the *incompressible*, *inviscid* airfoil calculation in *FLUENT* presented in class. Recall that the angle of attack, , was 5°.

Repeat the calculation for the airfoil for = 0° and = 10°. Save your calculation for each angle of attack as a different case file.

(a) Graph the pressure coefficient (C_p) distribution along the airfoil surface at = 5° and = 10° in the manner discussed in class (i.e., follow the aeronautical convention of letting C_p *decrease* with increasing ordinate (*y*-axis) values).

What change do you see in the C_p distribution on the upper and lower surfaces as you increase the angle of attack?

Which part of the airfoil surface contributes most to the increase in lift with increasing ?

Hint: The area under the C_p vs. x curve is approximately equal to C_l.

(b) Make a table of C_l and C_d values obtained for = 0°, 5°, and 10°. Plot C_l vs. for the three values of . Make a linear least-squares fit of this data and obtain the slope. Compare your result to that obtained from inviscid, thin-airfoil theory:

$$\frac{dC_l}{d\alpha} = \frac{2\pi^2}{180},$$

where is in degrees.

Go to Problem 2

See and rate the complete Learning Module

Go to all FLUENT Learning Modules