C++ PROGRAM TO CALCULATE AERODYNAMIC COEFFICIENTS

The structure of the program is as follows:

1. The user inputs a file “coefficients.txt”
2. The program reads the file, ignores first line, and adds the values of α, C_D, C_Y, C_L into 4 arrays
3. CDO, CYO CLO = CD, CY, CL | $\alpha = 0$
4. User inputs Angle of attack α in degrees (α_{in})
5. Program calculates stability derivatives with formula
   $CN = \mathrm{CN}|\mathrm{a} + \frac{\mathrm{dCN}}{\mathrm{da}}(\mathrm{a})$, where a = α_{in}, $\frac{\mathrm{dCN}}{\mathrm{da}}$ found using midpoint method with a total step size = 0.2, N is any property (e.g. D,Y,L)
6. Program puts α_{in} and CD,CY,CL into matrices and solves CX,CY,CZ

$$\begin{Bmatrix} C_X \\ C_Y \\ C_Z \end{Bmatrix} = \begin{bmatrix} \cos\alpha & 0 & -\sin\alpha \\ 0 & 1 & 0 \\ \sin\alpha & 0 & \cos\alpha \end{bmatrix} \begin{Bmatrix} -C_D \\ C_Y \\ -C_L \end{Bmatrix}$$

(reference: Flight Dynamics by Wayne Durham)