



Airfoil Analysis Assignment

Nathan Lehnhof and Austin McGlashan

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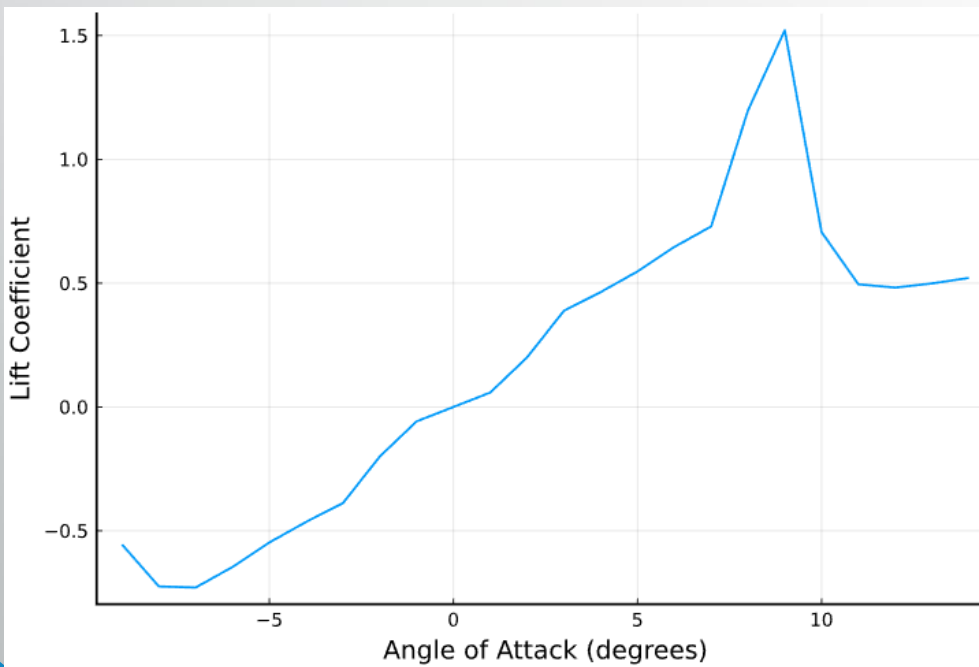


Effect of airfoil angle of attack on airfoil lift, drag, and moment coefficients

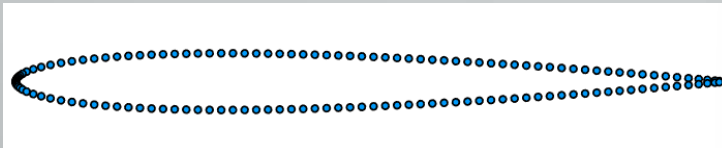
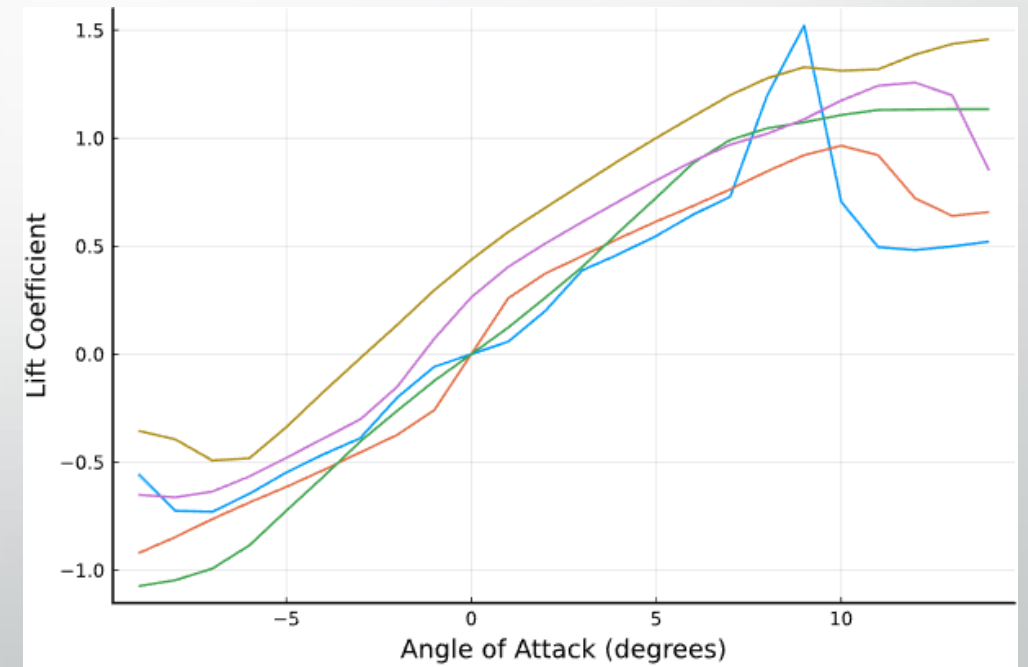
Cl vs AoA

Increasing the angle of attack leads to an increase in lift coefficient.

Airfoil used was NACA 0008



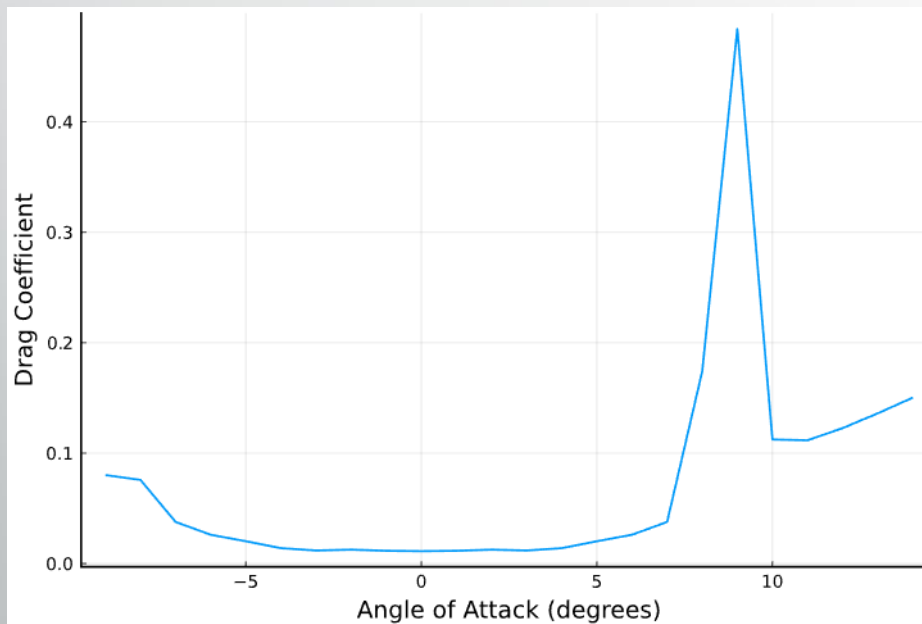
Airfoils used were NACA 0008, NACA 0012, NACA 0021, NACA 2412, NACA 4412



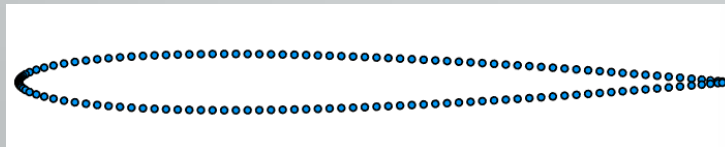
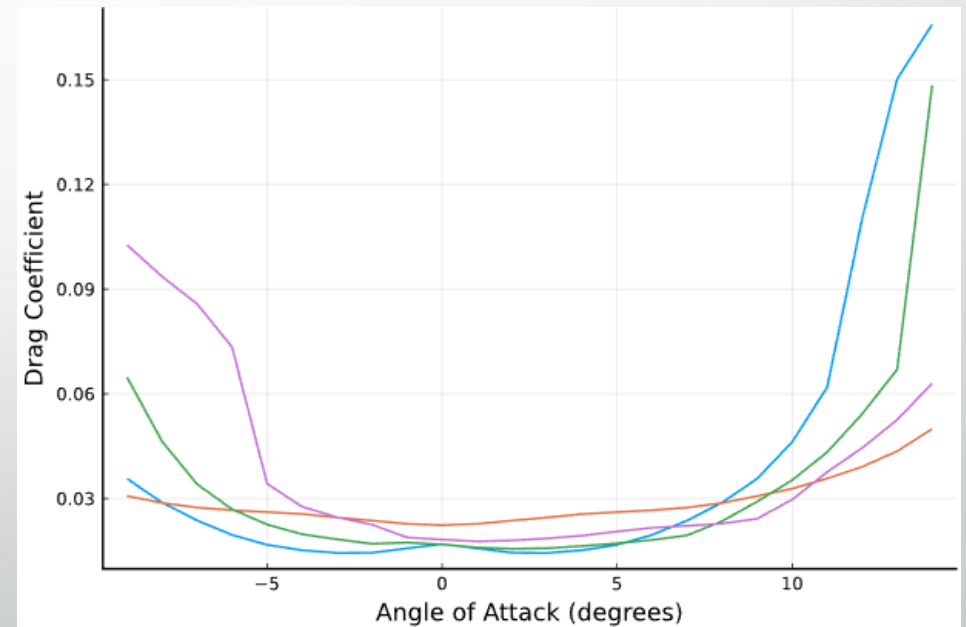
Cd vs AoA

Increasing the angle of attack eventually leads to increase in drag coefficient.

Airfoil used was NACA 0008



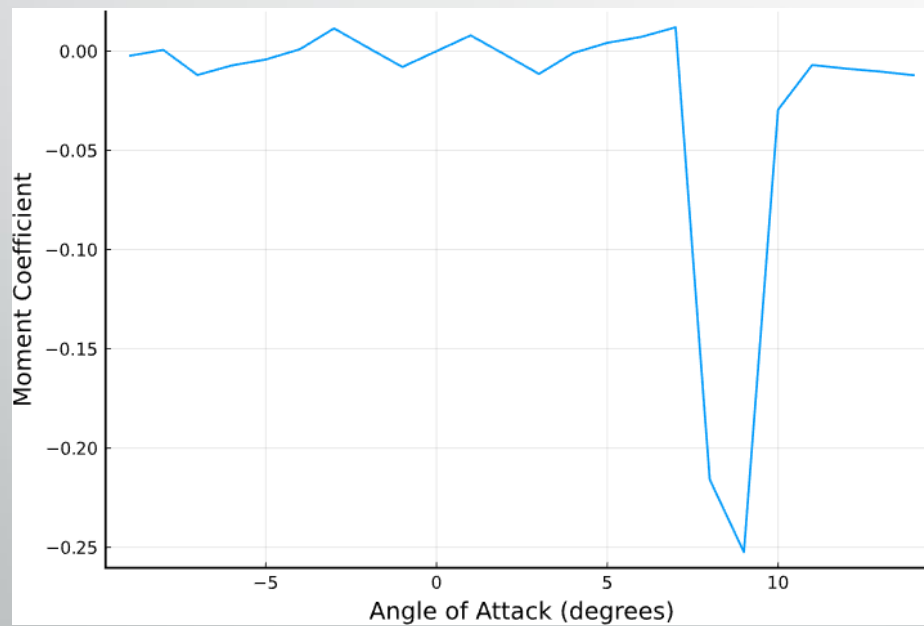
Airfoils used were NACA 0012, NACA 0021, NACA 2412, NACA 4412



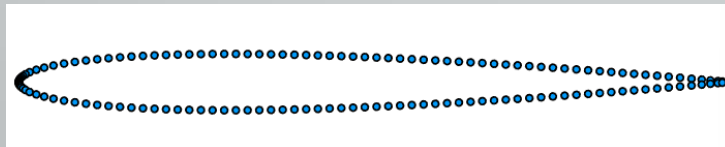
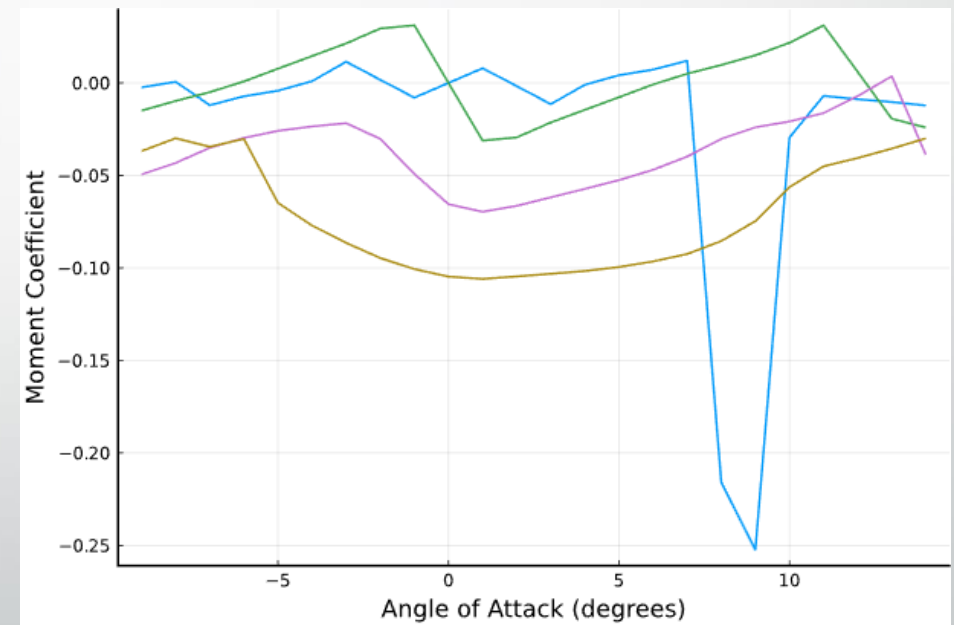
C_m vs AoA

Increasing the angle of attack has minimal effect on moment coefficient within operation angles of attack.

Airfoil used was NACA 0008



Airfoils used were NACA 0008, NACA 0012, NACA 0021, NACA 2412, NACA 4412





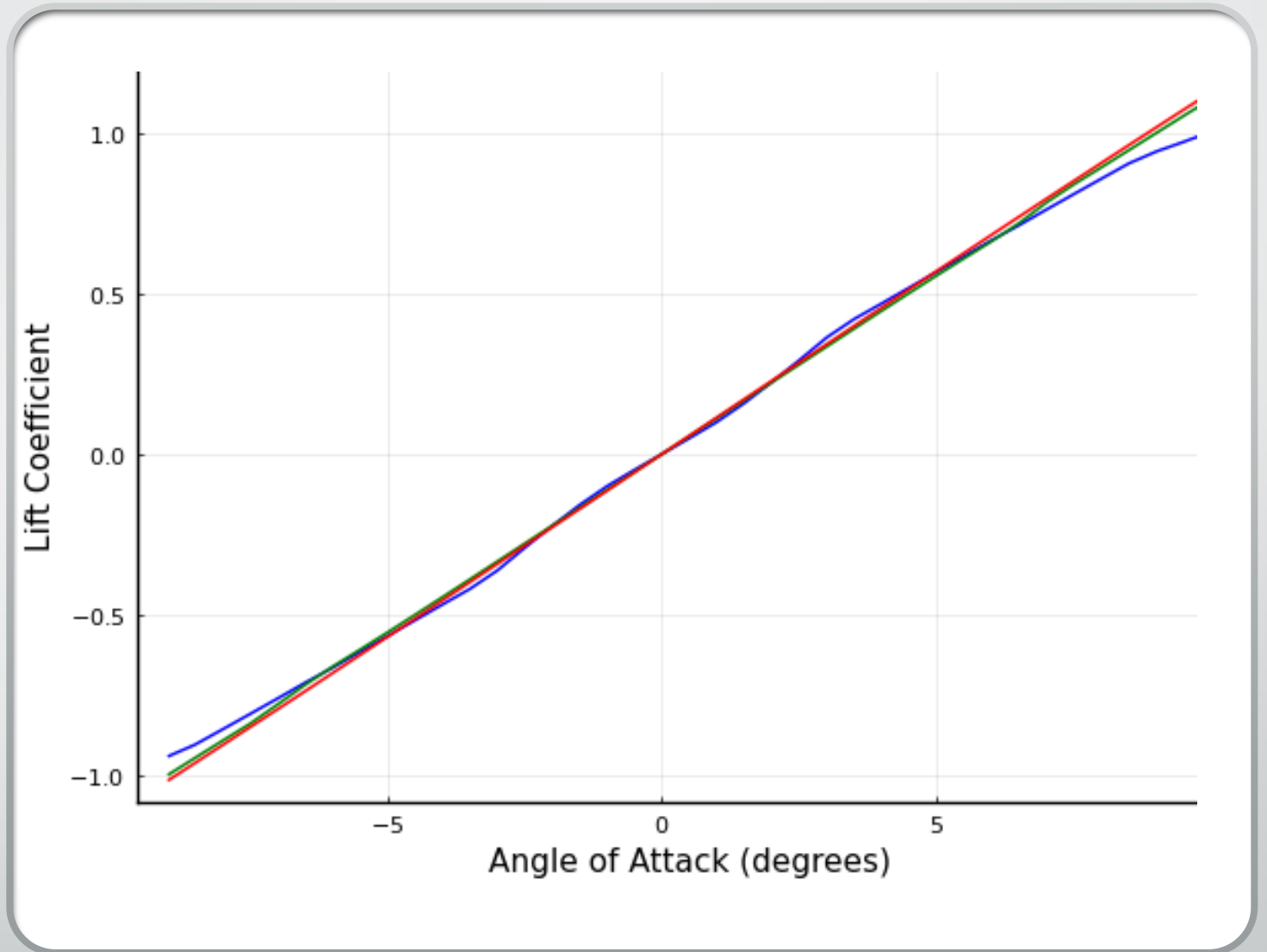
Effect of Reynolds number on airfoil lift, drag, and moment

Effect of Re on Cl

- Re $1e6$ = Blue
- Re $1e7$ = Green
- Re $1e8$ = Red

A higher Re has little effect on Cl in operational AoA, though it results in a higher stall AoA.

*NACA 0008



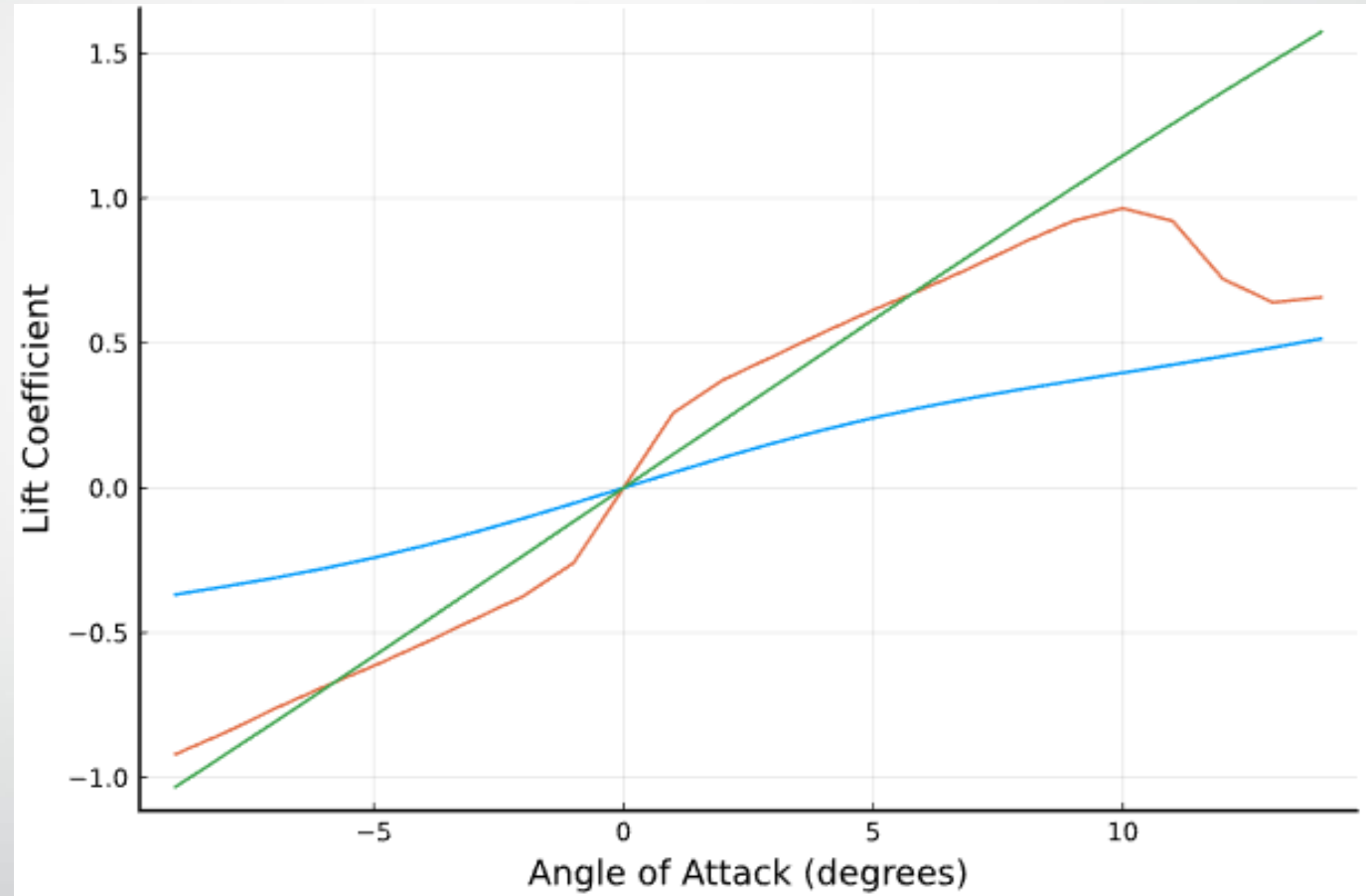
Effect of Re on C_l

Airfoil used was NACA 0012 with
Reynolds numbers:

$1e3$ (blue)

$1e5$ (red)

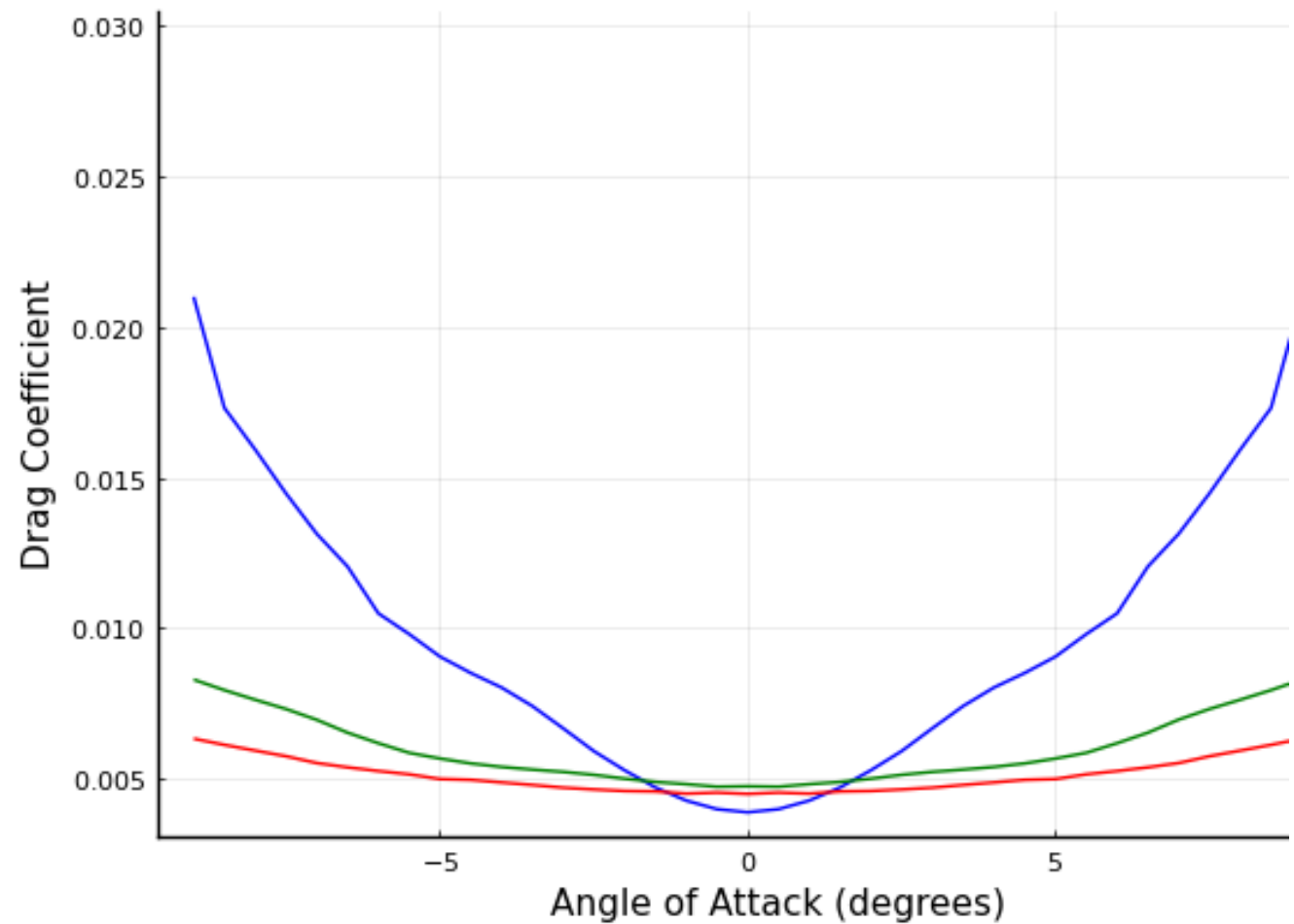
$1e8$ (green)



Effect of Re on Cd

- Re $1e6$ = Blue
- Re $1e7$ = Green
- Re $1e8$ = Red

A higher Re results in a lower Cd over greater AoA.



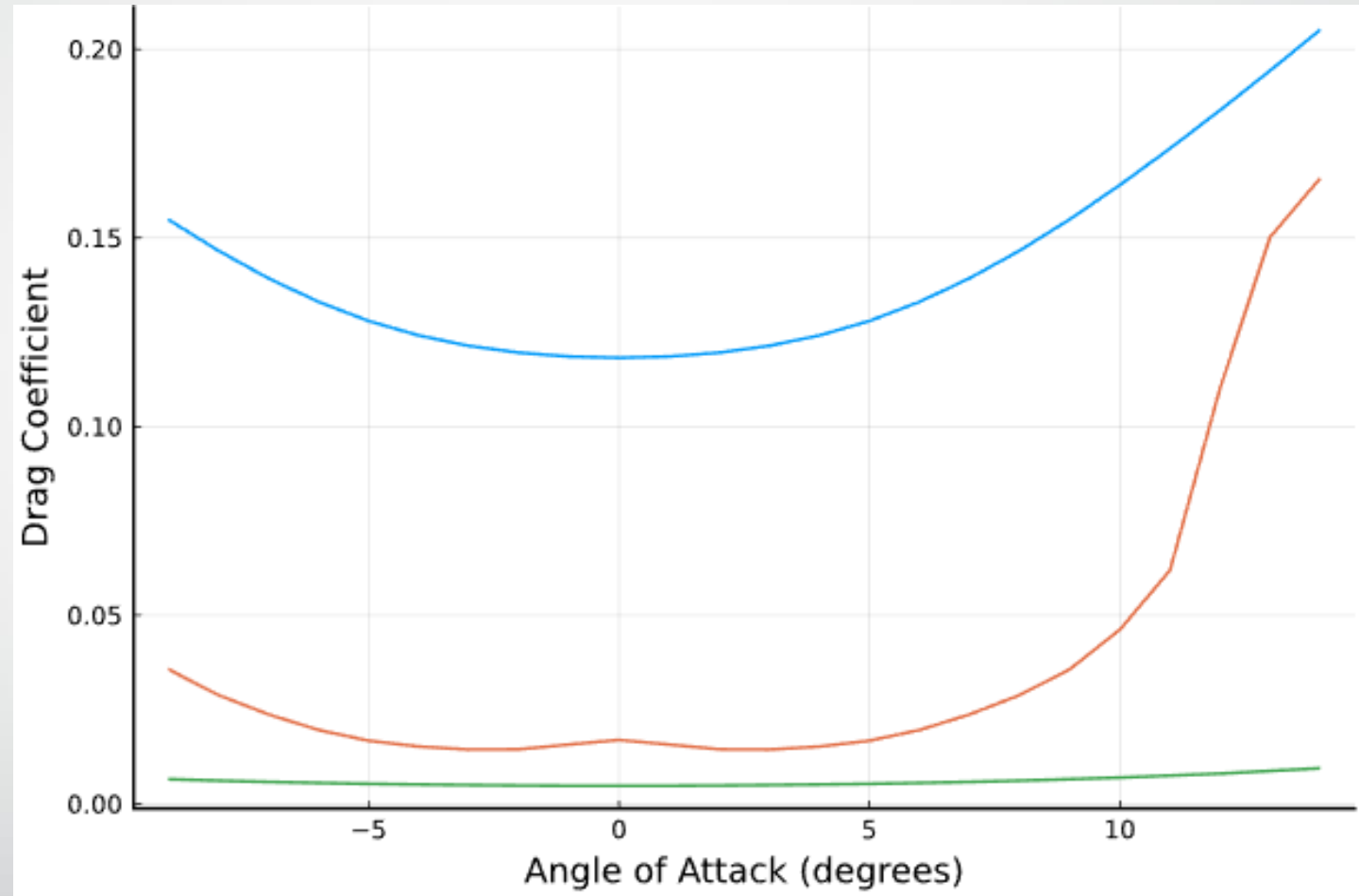
Effect of Re on Cd

Airfoil used was NACA 0012 with
Reynolds numbers:

1e3 (blue)

1e5 (red)

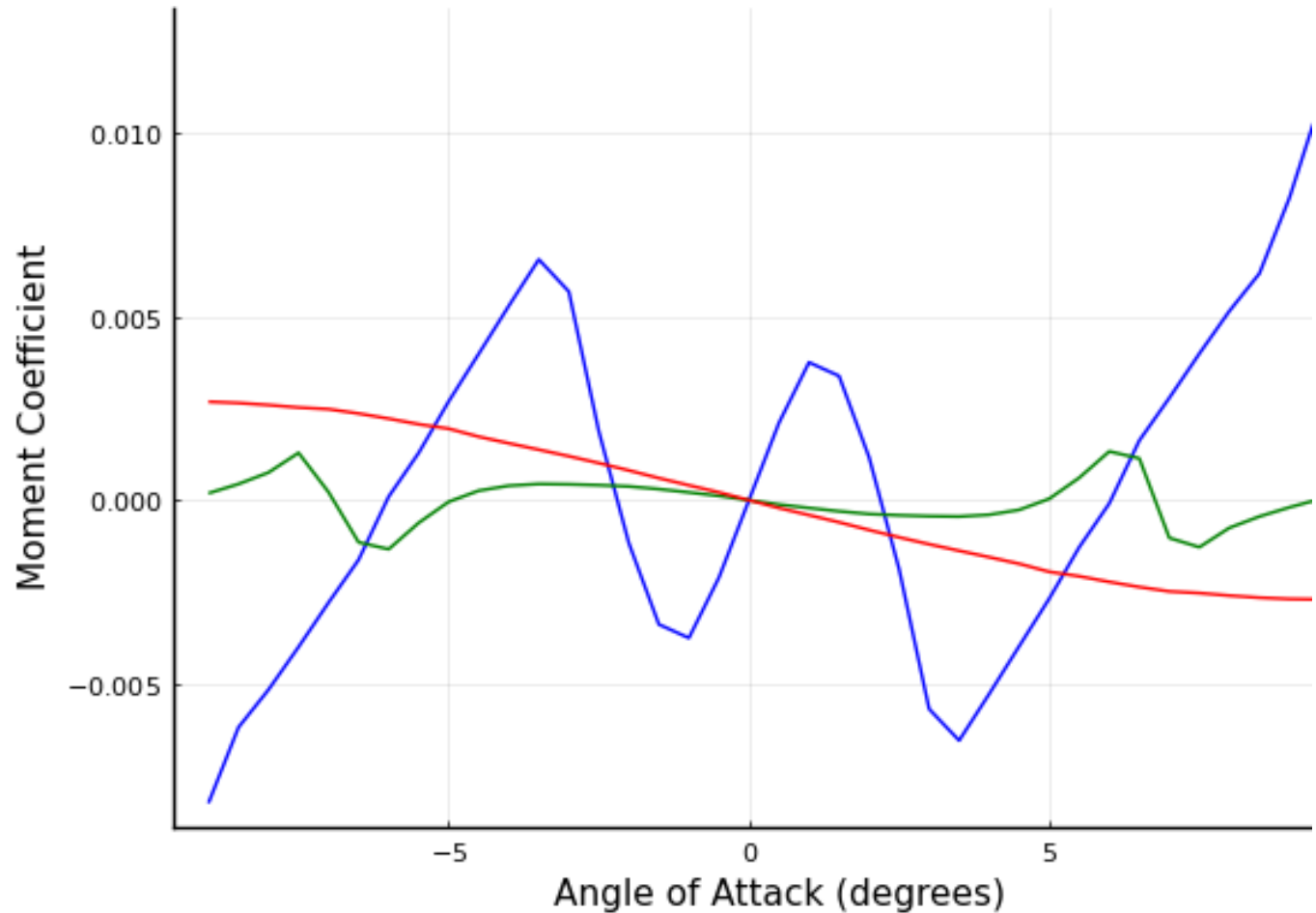
1e8 (green)



Effect of Re on C_m

- Re $1e6$ = Blue
- Re $1e7$ = Green
- Re $1e8$ = Red

A higher Re results in a more constant C_m over greater AoA.



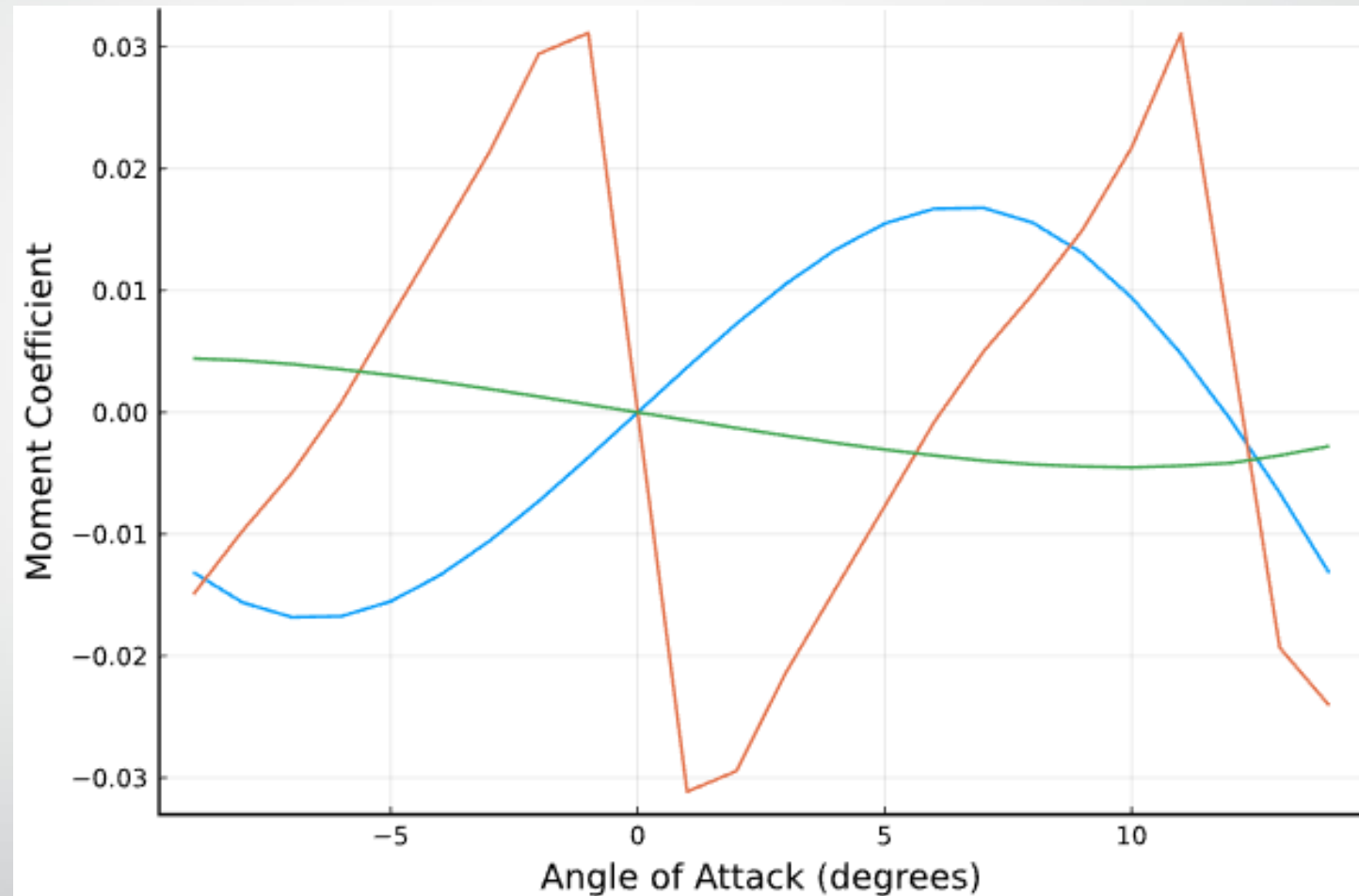
Effect of Re on C_m

Airfoil used was NACA 0012 with
Reynolds numbers:

$1e3$ (blue)

$1e5$ (red)

$1e8$ (green)



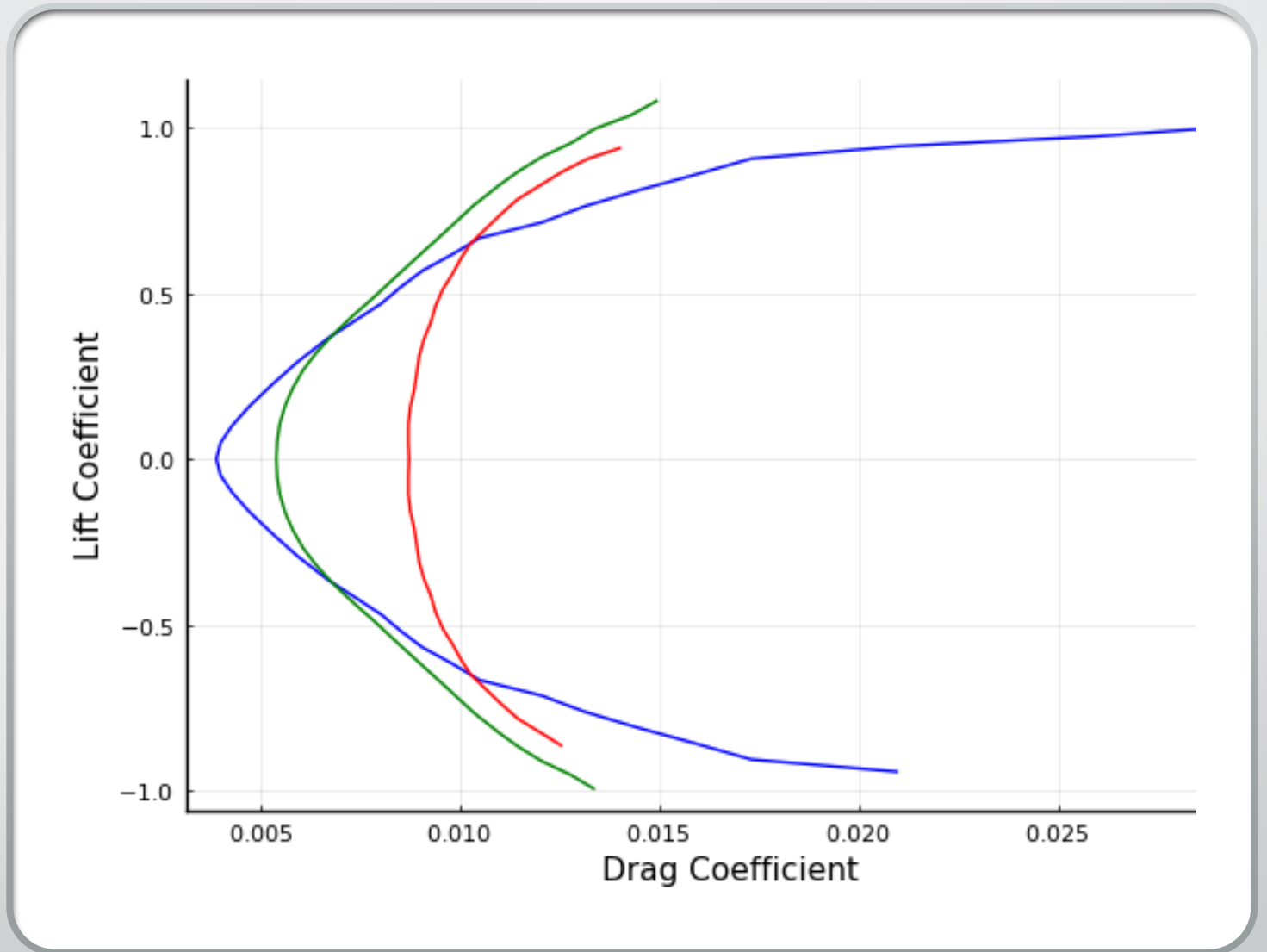


Effect of airfoil thickness and camber on airfoil lift to drag ratio and lift curve slope behavior

Airfoil Thickness and Lift to Drag Ratio

- Blue = NACA 0008
- Green = NACA 0012
- Red = NACA 0024

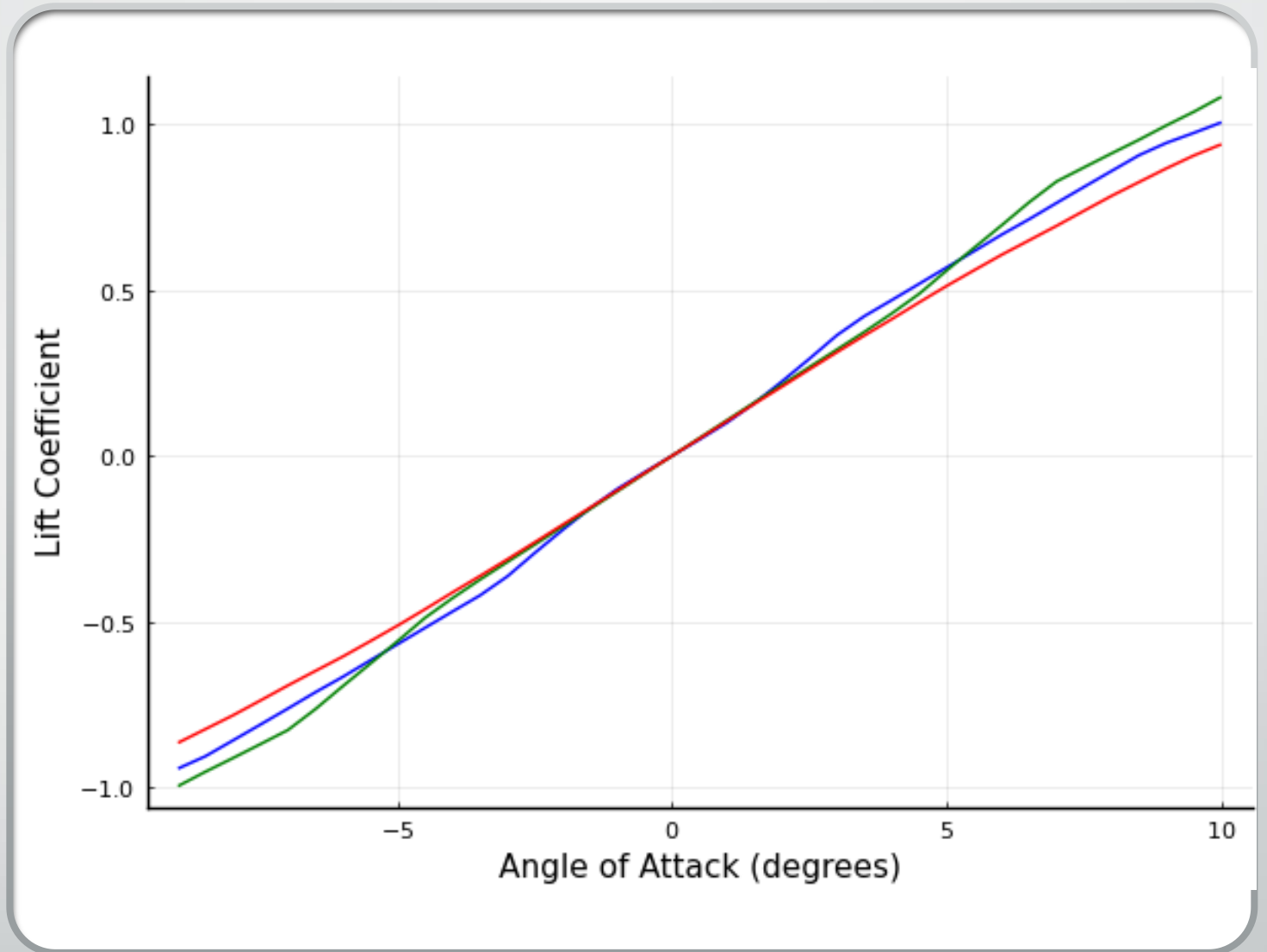
A higher airfoil thickness results in a smaller C_l/C_d ratio.



Airfoil Thickness and Lift Curve Slope

- Blue = NACA 0008
- Green = NACA 0012
- Red = NACA 0024

A greater airfoil thickness has little effect on C_l within operational AoA. The slope of the C_l vs AoA curve is generally greater for thinner airfoils.



Camber and Lift to Drag Ratio

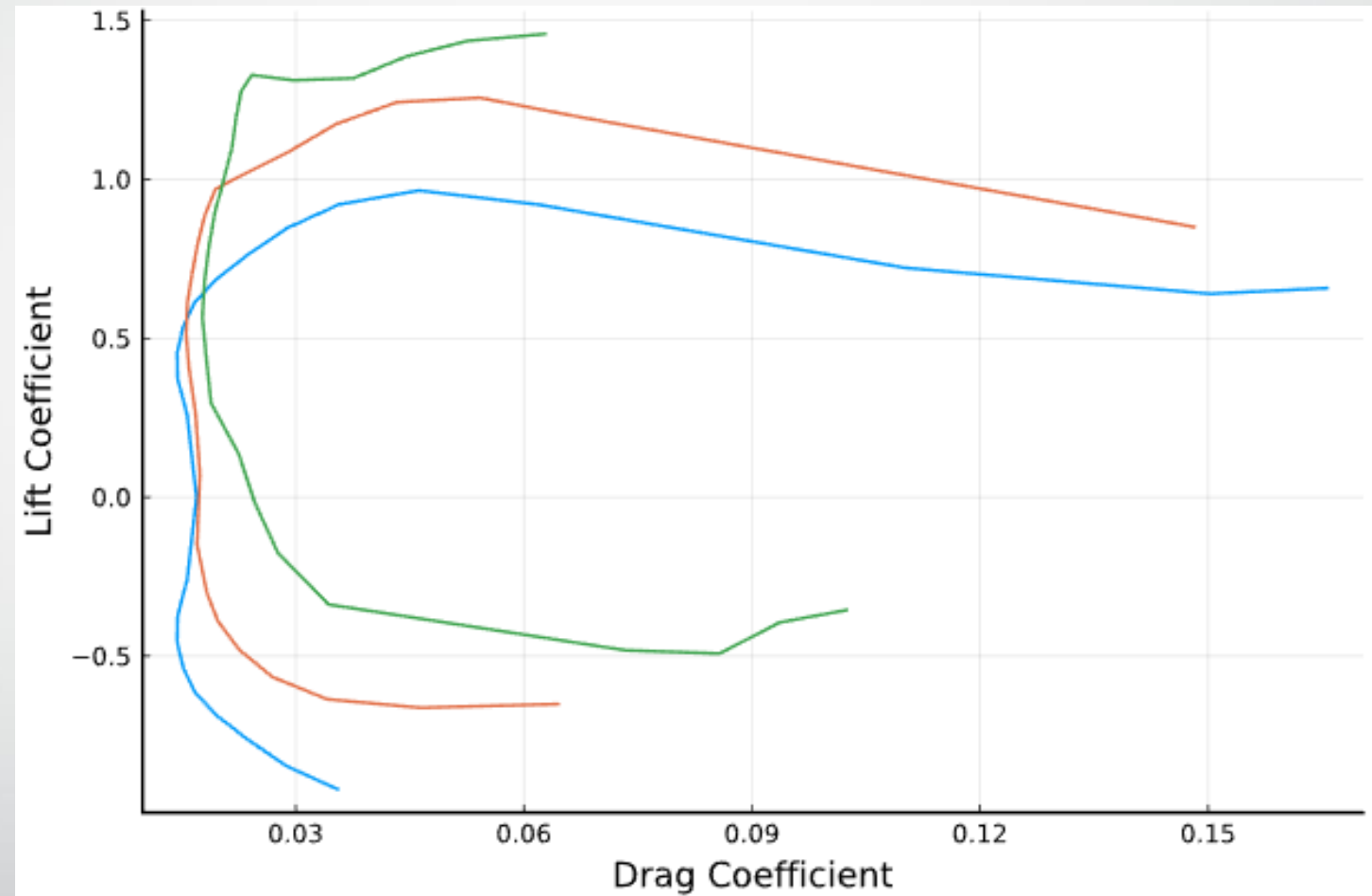
Airfoils used were:

NACA 0012 (blue)

NACA 2412 (red)

NACA 4412 (green)

Increasing airfoil camber leads to an increase in airfoil lift to drag ratio.



Camber and Lift Curve Slope

Airfoils used were:

NACA 0012 (blue)

NACA 2412 (red)

NACA 4412 (green)

Increasing airfoil camber leads to an increase in airfoil lift coefficient.

