Table of Contents

```
% Joshua Oates - Lab 5
```

Section 0 - clean up

```
clear all;
close all;
clc;
addpath('Data')
```

Section 1 - plot the wing

```
air1= load('airfoil_1.txt');
air2= load('airfoil_2.txt');

p1 = polyfit(air1(:,1),air1(:,2),5);
p2 = polyfit(air2(:,1),air2(:,2),5);
air1Chord = abs([min(air1(:,1)),max(air1(:,1))]);
air2Chord = abs([min(air2(:,1)),max(air2(:,1))]);
X1 = linspace(air1Chord(1),air1Chord(2));
X2 = linspace(air2Chord(1),air2Chord(2));
Z1 = polyval(p1,X1);
Z2 = polyval(p2,X2);

% figure
% hold on
% plot(air1(:,1),air1(:,2),'* r')
% plot(air2(:,1),air2(:,2),'* b')
% plot(X1,Z1,'r')
% plot(X2,Z2,'b')
% axis('equal')

Ydomain = 1;
Y1 = zeros(length(X1),1);
Y2 = ones(length(X1),1);
X = [X1',X2'];
Z = [Z1',Z2'];
Y = [Y1,Y2];
figure
hold on
surf(X,Y,Z,EdgeColor = 'none')
surf(X,Y,-Z,EdgeColor = 'none')
axis('equal')
```
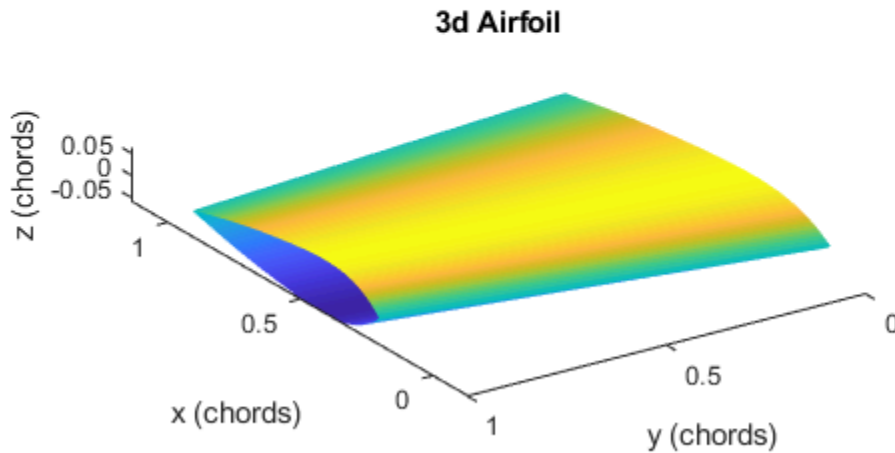
```
title("3d Airfoil")
xlabel("x (chords)")
ylabel("y (chords)")
zlabel("z (chords)")
campos([-2,2,1.5])
camtarget([1,0,0])

clear air1 air2 air2Chord air1Chord X1 X2 X Y1 Y2 Y Z1 Z2 Z Ydomain p1 p2
```


Section 2 - plot wind tunnel data

```
cl = load('cl_data.txt');
cd = load('cd_data.txt');
cltrim = [cl((1:13),(1:2));cl((36:49),(1:2))];

p1 = polyfit(cltrim(:,1),cltrim(:,2),1);
X1 = linspace(-6,9);
Y1 = polyval(p1,X1);

p2 = polyfit(cd(:,1),cd(:,2),2);
X2 = linspace(min(cd(:,1)),max(cd(:,1)));
Y2 = polyval(p2,X2);


figure
hold on
```

```matlab
plot(cl(:,1),cl(:,2),'. g')
plot(cltrim(:,1),cltrim(:,2),'. b')
plot(cd(:,1),cd(:,2),'. r')
plot(X2,Y2, 'r')
plot(X1,Y1, 'k')
plot(0,p1(2), '* k')
legend("Coeff Lift", "Cl Used for Best Fit","Coeff Drag","Cd Best Fit","Cl
 Best Fit","Cl0",Location='northwest')
title("Plot of Aerodynamic Properties vs Angle")
xlabel("Angle of Attack")

disp("I found Cl0 to be "+ p1(2))
disp("I found the proportionality constant between angle of attack and lift
 coefficient to be "+ p1(1))
disp("I found the equation of the quadratic of best fit for the Coeff Drag to
 be: "+p2(1)+ "X^2+ "+p2(2)+ "X+ "+p2(3))
```

I found Cl0 to be 0.17513
I found the proportionality constant between angle of attack and lift
coefficient to be 0.10348
I found the equation of the quadratic of best fit for the Coeff Drag to be:
0.00034224X^2+ -0.0014287X+ 0.015096

Plot of Aerodynamic Properties vs Angle