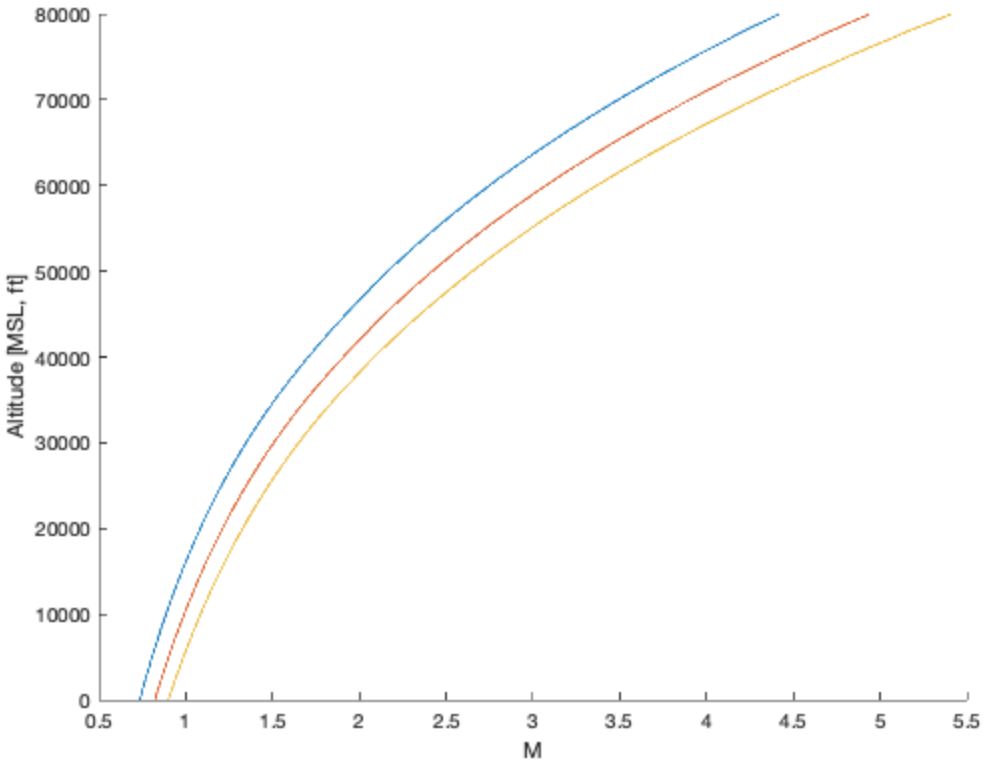
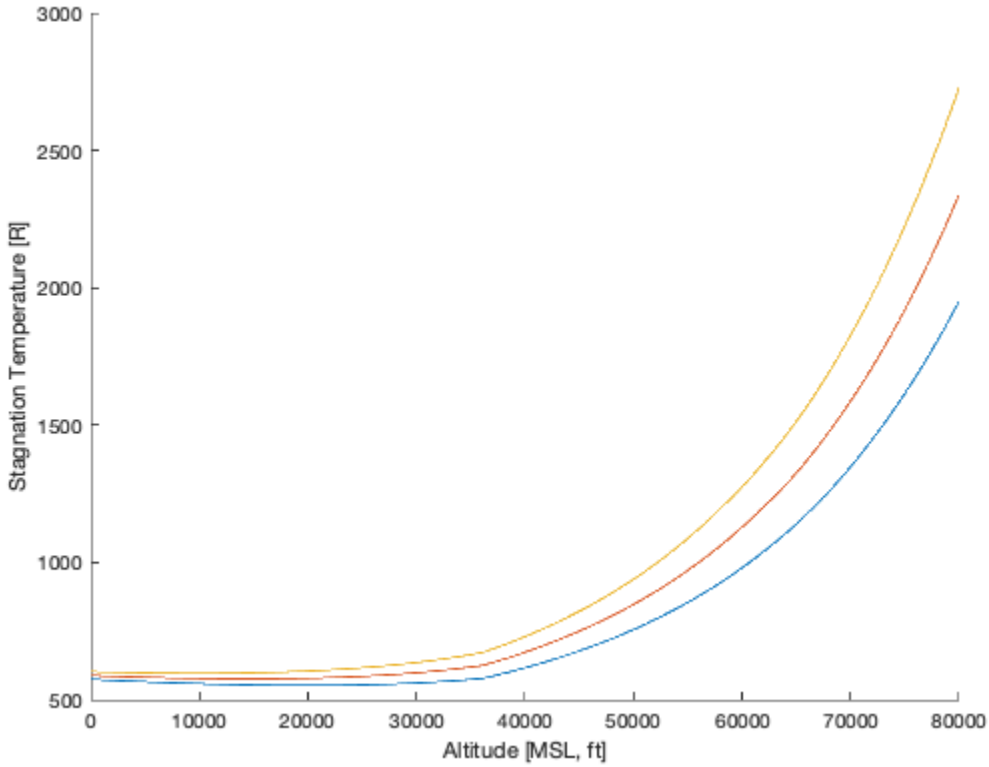
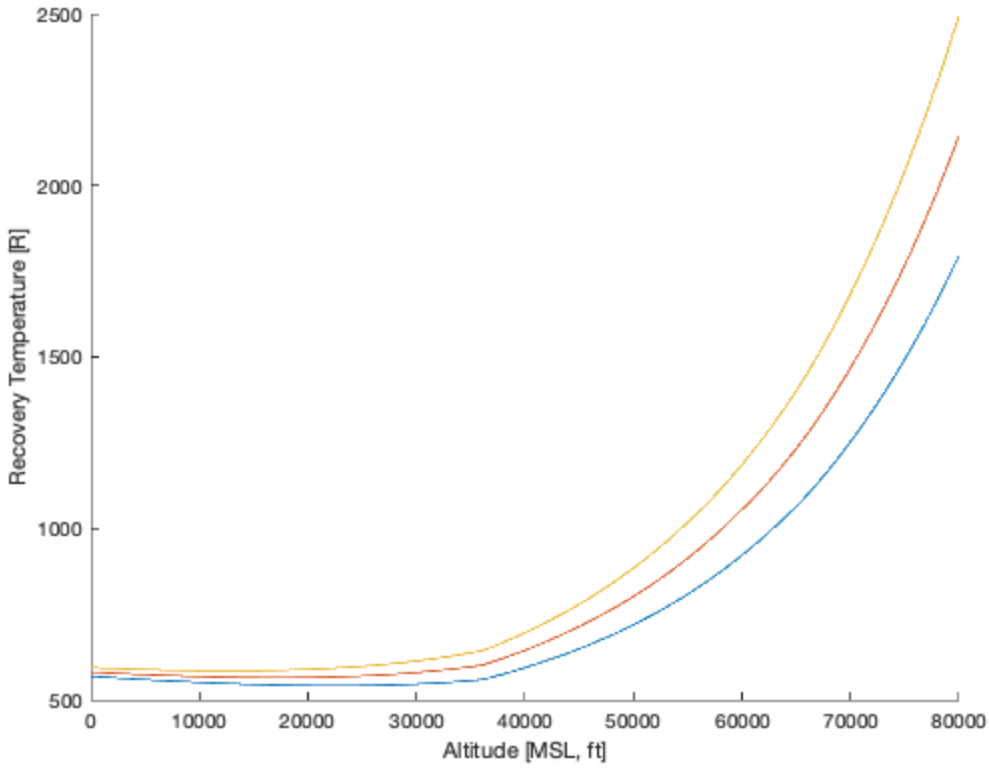
Problem 1 - Constant Dynamic Pressure Flight Corridor

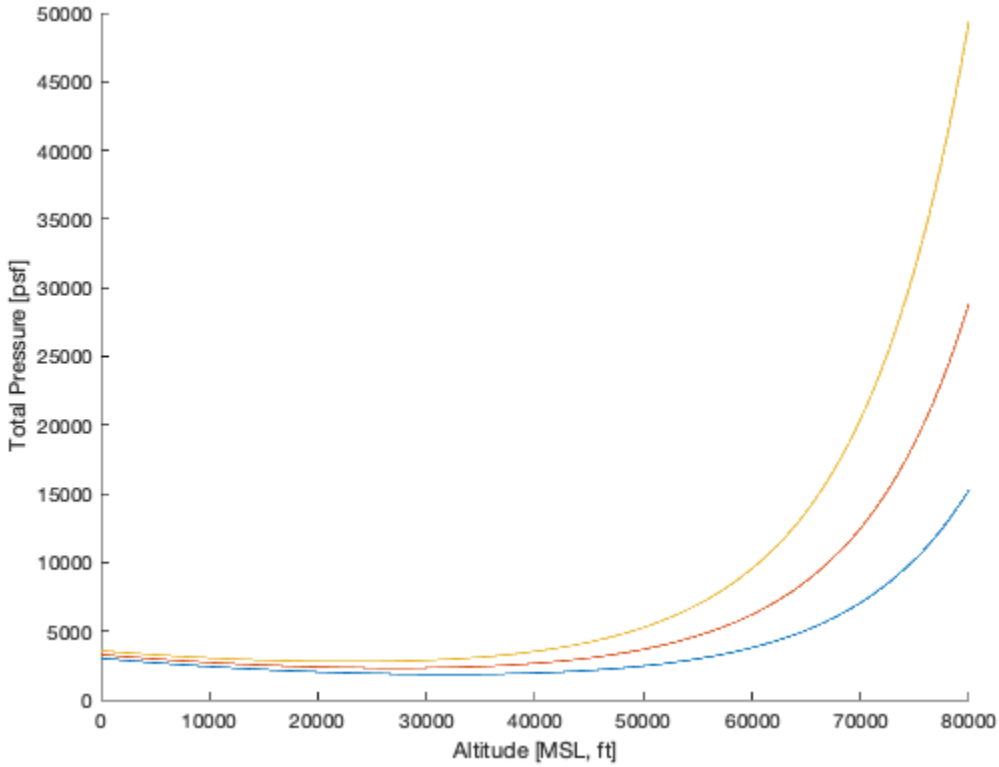
```
clear, clc, close all

% Inputs
Hvector = linspace(0, 80000,1000);
GeometricFlag = 1;

% Atmosphere Model
[temp,press,rho,Hgeopvector] = atmosphere(Hvector,GeometricFlag);


qs = [800, 1000, 1200]; % psf
for i = 1:length(qs)
    q = qs(i);

    % Find speed of sound
    R = 1717;
    g = 1.4; % gamma
    g1 = (g-1)/2;
    g2 = g/(g-1);
    a = sqrt(g*R*temp);


    % Find Mach Number (Part A)
    v = sqrt(2./rho*q);
    M = v./a;

    figure(1)
    hold on
    plot(M,Hvector)
    xlabel('M')
    ylabel('Altitude [MSL, ft]')
    ax = gca;
    ax.XRuler.Exponent = 0;
    ax.YRuler.Exponent = 0;


    % Find Stagnation Temperature (Part B)
    % Note: T_stag = Tt

    Tt = (1 + (g-1).*M.^2/2).*temp;

    figure(2)
    hold on
    plot(Hvector,Tt)
    xlabel('Altitude [MSL, ft]')
    ylabel('Stagnation Temperature [R]')
    ax = gca;
    ax.XRuler.Exponent = 0;
```

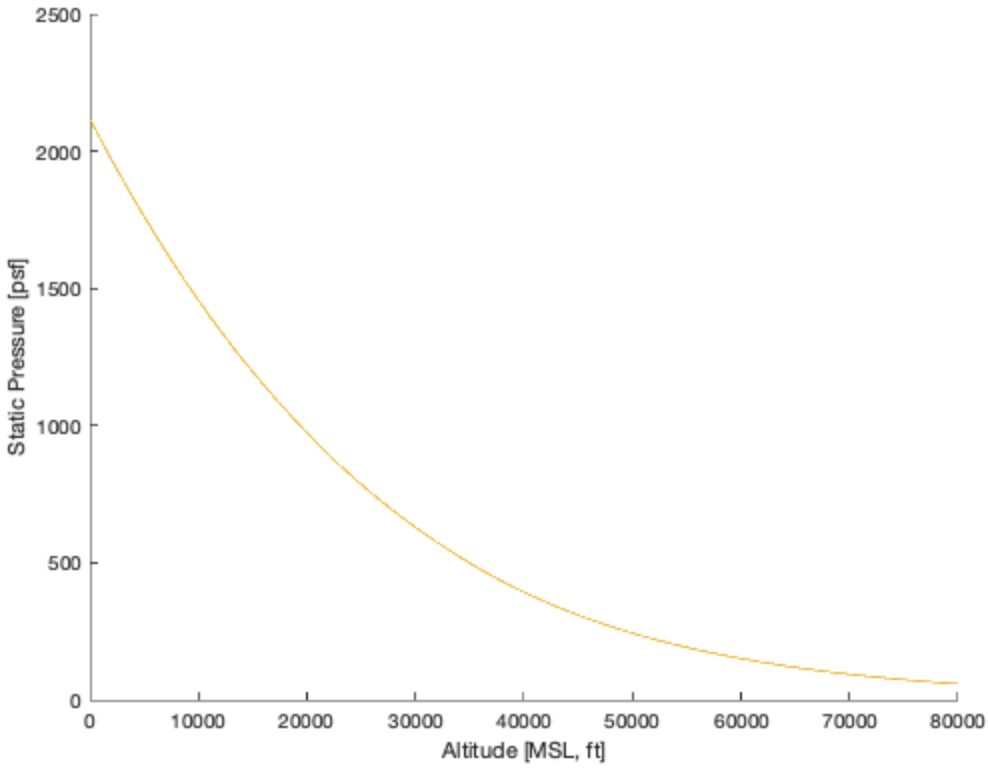
```
    ax.YRuler.Exponent = 0;

    % Find Recovery Temperature (Part C)

    r = .73^(1/3); % recovery coefficient
    Tr = temp .* (1 + r*(g-1)/2.*M.^2);

    figure(3)
    hold on
    plot(Hvector,Tr)
    xlabel('Altitude [MSL, ft]')
    ylabel('Recovery Temperature [R]')
    ax = gca;
    ax.XRuler.Exponent = 0;
    ax.YRuler.Exponent = 0;

    % Find Stagnation Pressure (Part D)
    Pt = press .* (1 + g1 .* M.^2).^g2;

    figure(4)
    hold on
    plot(Hvector,Pt)
    xlabel('Altitude [MSL, ft]')
    ylabel('Total Pressure [psf]')
    ax = gca;
    ax.XRuler.Exponent = 0;
    ax.YRuler.Exponent = 0;

    % Static Pressure is already known (Part E)

    figure(5)
    hold on
    plot(Hvector,press)
    xlabel('Altitude [MSL, ft]')
    ylabel('Static Pressure [psf]')
    ax = gca;
    ax.XRuler.Exponent = 0;
    ax.YRuler.Exponent = 0;

end

Convert from geometric altitude to geopotential altitude in feet
```


80000
70000
60000
50000
40000
30000
20000
10000
0
Altitude [MSL, ft]
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
M


3000
2500
2000
1500
1000
500
Stagnation Temperature [R]
0
10000
20000
30000
40000
50000
60000
70000
80000
Altitude [MSL, ft]


Recovery Temperature [R]
2500
2000
1500
1000
500
0
10000
20000
30000
40000
50000
60000
70000
80000
Altitude [MSL, ft]


Total Pressure [psf]
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
10000
20000
30000
40000
50000
60000
70000
80000
Altitude [MSL, ft]



Published with MATLAB® R2019b