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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% AAE251 Fall 2024
% Homework 9
% AAE251_HW9_Q1cd
% Author: Preston Wright and Hudson Reynolds
% Description: Sets up and calculates the available and required thrust with
% respect to altitude for a given jet aircraft, plotting those values versus
% the altitude used to calculate them.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Initializations

```
alt = linspace(0,30,30*100+1); % Altitude array [km]
thrustAvailable = []; % Initialized available thrust array [N]
thrustRequired = []; % Initialized required thrust array [N]

rhoSea = 1.2250; % Density at sea level [kg/m^3]
g = 9.81; % Gravitational acceleration [m/s^2]
m = 33100; % Mass of the aircraft [kg]
mAD = 0.6; % Air density exponent
thrustMax = 55620; % Maximum available thrust at sea level [N]
K = 0.05; % Wingspan efficiency
parasiteDrag = 0.015; % Parasitic drag
```

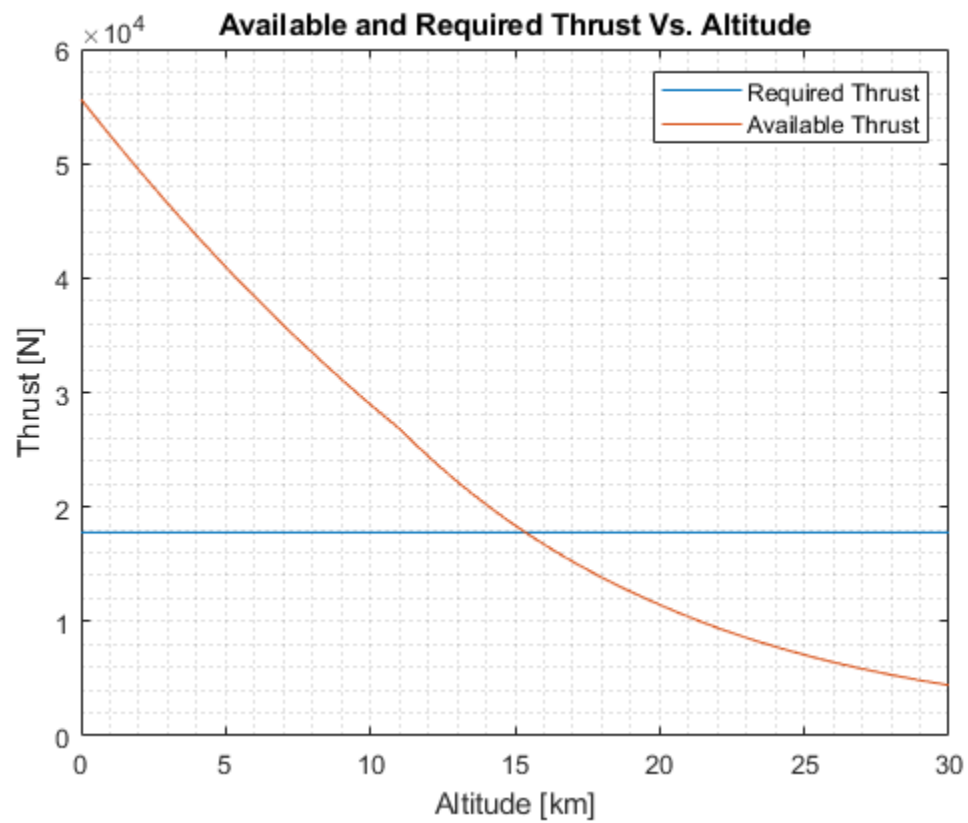
Calculations

```
% Loop through the altitudes calculating the available and required thrust
for i = 1:length(alt)
    [~,~,~,rhoAlt] = atmosisa(alt(i)*1000, extended="on");
    thrustAvailable(i) = ((rhoAlt/rhoSea)^mAD)*thrustMax;
    thrustRequired(i) = 2*m*g*sqrt(K*parasiteDrag);
end
```

Graphing

```
% Output the required and available thrust with respect to altitude
figure(1)
plot(alt,thrustRequired)
hold on
plot(alt,thrustAvailable)
grid minor
title("Available and Required Thrust Vs. Altitude")
```

```
xlabel("Altitude [km]")
ylabel("Thrust [N]")
legend("Required Thrust", "Available Thrust", location="northeast")
```



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