FUNC: Thrust CALCULATOR (level flight)

>> Details

(1) Description: This program defines the equations for the lift and drag (level flight), and calculates them using the variables involved in the equation as inputs.

(2) Input values:

1. den: atmospheric denstiy [kg/m^3] or [slug/ft^3]
2. vel: free stream velocity [m/s] or [ft/s]
3. area: wing area [m^2] or [ft^2]
4. D_o: lift zero drag coefficient
5. weight: the weight of the aircraft [N] or [lb]
6. AR: aspect ratio of the wing
7. e_o: the Oswald efficiency factor

(3) Output values:

1. T: thrust [N] or [lb]

(4) Theory

$$\text{Lift} = L = \frac{1}{2}\rho_\infty V_\infty^2 S C_L$$

$$\text{Drag} = D = \frac{1}{2}\rho_\infty V_\infty^2 S C_D$$

at level flight

$$L \approx mg \implies C_L = \frac{2mg}{\rho_\infty V_\infty^2 S}$$

$$C_D = C_{Do} + \frac{C_L^2}{\pi e AR}$$

$$\text{thrust} = T \approx D$$

```
function [T] = thrust_cal(den, vel, area, D_o, weight, AR, e_o)
% Calculate the coefficients
L_const = 2 * weight / den / vel^2 / area;
D_const = D_o + L_const^2 / pi / e_o / AR;
% Calculate the list and drag
L = 0.5 * den * vel^2 * area * L_const;
D = 0.5 * den * vel^2 * area * D_const;
% Thrust output
T = D;
end
```