```
function const = getConst()
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% This function creates a structure of initial conditions and relevant
% constants for the main function. This truncates the state_matrix_func
% inputs by taking in only this structure.

% No inputs are required for the function.
% Output is a structure with multiple different entries

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

    const.g = 9.807; %m/s^2 (gravitational constant)
    const.c_dis = 0.8; %(Discharge constant)
    const.rho_air = 0.961; %kg/m^3 (Density of ambient air)
    const.V_b = 0.002; %m^3 (Volume of bottle)
    const.p_atm = 12.1 * 6894.76; %psia to Pa (pressure of atmosphere)
    const.gamma = 1.4; %unitless (specific heat reatio constant)
    const.rho_w = 1000; %kg/m^3 (density of water)
    const.d_e = 2.1; %cm (diameter of exit)
    const.d_b = 10.5; %cm (diameter of bottle)
    const.R_air = 287; %J/kgK (Gas constant for air)
    const.m_b = 0.15; %kg (mass of bottle)
    const.c_D = 0.48; %Coefficient of drag)
    const.p_0 = 52* 6894.76 + const.p_atm; %psig to Pa (initial pressure in
 bottle) 52* 6894.76 + const.p_atm
    const.V_0w = 0.00095; %m^3 (Initial volume of water)
    const.T_0 = 300; %k (Initial temperature of air)
    const.v_0 = 0.0; %m/s (initial velocity)
    const.theta_i = 42*(pi/180); % degrees to radian (launch angle)
    const.x_0 = 0; %m (initial x position)
    const.z_0 = 0.25; %m (initial z position)
    const.l_s = 0.5; %m (length of launch stand)


    % Calculating other necessary constants and initial conditions
    const.At  =   pi*((const.d_e/2)*0.01)^2; %m^2 (Cross sectional area of
 throat)
    const.Ab  =   pi*((const.d_b/2)*0.01)^2; %m^2 (Cross sectional area of
 bottle)

    const.m_0w = const.rho_w * const.V_0w; %kg (initial mass of water)
    rho_0a = const.p_0/(const.R_air*const.T_0); %kg/m^3 (initial density of
 air)
    const.V_0a = const.V_b - const.V_0w; %m^3 (Initial volume of air)
    const.m_0a = const.V_0a * rho_0a; %kg (initial mass of air)

    const.m_0tot = const.m_b + const.rho_w * (const.V_b - const.V_0a) +
 (const.p_0*const.V_0a)/(const.R_air*const.T_0);
end
```

```
ans =

  struct with fields:

          g: 9.8070
      c_dis: 0.8000
    rho_air: 0.9610
        V_b: 0.0020
      p_atm: 8.3427e+04
      gamma: 1.4000
      rho_w: 1000
        d_e: 2.1000
        d_b: 10.5000
      R_air: 287
        m_b: 0.1500
        c_D: 0.4800
        p_0: 4.4195e+05
       V_0w: 9.5000e-04
        T_0: 300
        v_0: 0
    theta_i: 0.7330
        x_0: 0
        z_0: 0.2500
        l_s: 0.5000
         At: 3.4636e-04
         Ab: 0.0087
       m_0w: 0.9500
       V_0a: 0.0011
       m_0a: 0.0054
     m_0tot: 1.1054
```

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