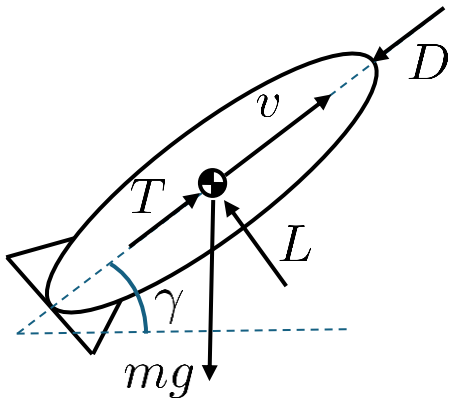
The nonlinear dynamics of a shuttle during the climb are described by these four coupled differential equations:

$$m\dot{v} = T - C_D v^2 - mg\sin\gamma$$

$$m\dot{\gamma}v = C_L v^2 - mgcos\gamma$$

$$\dot{h} = v\sin\gamma$$

$$\dot{m} = -\alpha T$$



*rotational inertia negligible

$x_1 = h$	Altitude
$x_2 = v$	Velocity
$x_3 = m$	Mass (varies with the fuel consumption)
$x_4 = \gamma$	Flight angle
$u = T$	Thrust (control input)
C_D, C_L	Drag and Lift Coefficients (constant)
α	Constant related to fuel consumption

$$\dot{x}_1 = x_2\sin x_4$$

$$\dot{x}_2 = \frac{u(t)}{x_3} - \frac{C_D x_2^2}{x_3} - g\sin x_4$$

$$\dot{x}_3 = -\alpha u(t)$$

$$\dot{x}_4 = \frac{C_L x_2}{x_3} - \frac{gcos x_4}{x_2}$$

Define a nonlinear control problem and solve it through indirect methods.
Feel free to consider additional control actions or introduce additional features/dynamics