$$\dot{X} = f(x, u)$$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \\ \dot{x}_4 \\ \dot{x}_5 \\ \dot{x}_6 \\ \dot{x}_7 \\ \dot{x}_8 \end{bmatrix} = \begin{bmatrix} x_2 \\ \dot{V}\cos x_7 - x_8 V sin x_7 \\ x_4 \\ -\dot{V} sin x_7 - x_8 V cos x_7 \\ x_6 \\ u_2/J \\ x_8 \\ \frac{\rho}{m}\dot{V}SC_{l_\alpha} + \frac{1}{2m}\rho VSC_{l_\alpha}\dot{\alpha} + \frac{g}{V}x_8 sin x_7 + \frac{u_1}{mV}x_8\dot{\alpha}cos\alpha - \frac{\dot{V}}{V}x_8 \end{bmatrix}$$

$$m\dot{V} = -D(V, \alpha) - mg sin x_7 + u_1 cos\alpha$$

$$\alpha = x_5 - x_7$$

$$\dot{\alpha} = x_6 - x_8$$

$$T = u_1, \qquad M = u_2$$

$$V = \frac{X_2 + X_4}{cos X_7 - sin X_7}$$