

$$\begin{array}{l}
tf(t)\\
F_T(t).^2\\
\text{http://www.thrustcurve.org/}\\
m_0\\
m_b\\
L_{CG}\\
L_{CP}\\
L_{tube}\\
L_{cone}\\
L_e\\
\tilde{m}_{tune}\\
m_{cone}\\
r_{in}\\
r_{out}\\
C_D\\
C_{N\alpha}\\
r_p\\
r^{spill}_p\\
C_p\\
S_p^{\quad 2}\\
S_p^{\quad 2}\\
I_{tube}.^2\\
I_{cone}.^2\\
L_{launcher}\\
w_R\\
Z_R\\
\tilde{n}^{33}\\
\rho\\
?(x_B,y_B,z_B)(x,y,z)z(x_B,y_B)(x,y)?D,Y,ND{-z_BYx_BN{-y_B}\\
\boldsymbol{v_{air}}=(V_{ax}(t),V_{ay}(t),V_{az}(t))\\
\boldsymbol{v}=(V_x(t),V_y(t),V_z(t))\\
\boldsymbol{w_z}=(V_{wx},V_{wy},V_{wz})\\
\boldsymbol{F_TF_Dgxm}
\end{array}$$

$$\begin{array}{l}
\boldsymbol{F_TrF_T}=F_T\boldsymbol{r}|\boldsymbol{F_T}|=F_T\\
l\boldsymbol{\bar{L}N\omega}3\times3I_x=I_y
\end{array}$$

$$\begin{array}{l}
\omega=[\omega_x,\omega_y,\omega_z]\\
\tilde{q}\\
\tilde{\omega}=[0,\omega_x,\omega_y,\omega_z]
\end{array}$$

$$\tilde{q}\boldsymbol{r}'=[0,0,1]\boldsymbol{r}\tilde{q}\tilde{q}^*$$

$$\begin{array}{l}
\tilde{q}\boldsymbol{r}\tilde{q}^*(\boldsymbol{r})\\
\boldsymbol{F_D}\\
C_D C_{N\alpha} \rho S \boldsymbol{v_{air}v_{air}}=(V_{ax}(t),V_{ay}(t),V_{az}(t))|\boldsymbol{v_{air}}|^2\\
Z_R=10
\end{array}$$

$$\boldsymbol{vv_{air}}=\tilde{q}^*(-\boldsymbol{v}+\boldsymbol{w_z})\tilde{q}DYN$$

$$\alpha\beta$$

$$\begin{array}{l}
\boldsymbol{F_DF_D}=\tilde{q}(Y,-N,-D)\tilde{q}^*\\
\boldsymbol{NI}\\
lxyI_{cxy}=
\end{array}$$

$$xyI_{bxy}I_{bxy}$$

$$\begin{array}{l}
I_eI_e=(m(t)-m_b)(L_{cone}+L_{tube}-L_e/2)^2\\
m(t)tt=0m_0m_bm_b\\
tr_{CG}r=(m_0-m_b)(L_{CG}-L_e/2)/m_0+L_{CG}
\end{array}$$

$$xyI_{xy}$$

$$zI_z$$