Equation 4.33 ⇒

$$\dot{p} = \frac{M_{bx} - (I_{zz} - I_{yy}) qr}{I_{xx}}$$

$$\dot{q} = \frac{M_{by} - (I_{xx} - I_{zz}) rp}{I_{yy}}$$

$$\dot{r} = \frac{M_{bz} - (I_{yy} - I_{xx}) pq}{I_{zz}}$$

$p \rightarrow y_1$
$q \rightarrow y_2$
$r \rightarrow y_3$

$\dot{y} = f(t, y)$

$p = y_1$
$q = y_2$
$r = y_3$

$$\dot{y}_1 = \frac{M_{bx} - (I_{zz} - I_{yy}) y_2 y_3}{I_{xx}}$$

$$\dot{y}_2 = \frac{M_{by} - (I_{xx} - I_{zz}) y_3 y_1}{I_{yy}}$$

$$\dot{y}_3 = \frac{M_{bz} - (I_{yy} - I_{xx}) y_1 y_2}{I_{zz}}$$

Equation 4.28 ⇒

$$\dot{u} = \frac{1}{m} F_{bx} - (qw - rv)$$

$$\dot{v} = \frac{1}{m} F_{by} - (ru - pw)$$

$$\dot{w} = \frac{1}{m} F_{bz} - (pv - qu)$$

$u \Rightarrow l_1$

$v \Rightarrow l_2$

$w \Rightarrow l_3$

→ $\dot{l} = f(t, l)$ time derivation eq - 4 - 28

$\dot{u} \Rightarrow \dot{l}_1$

$\dot{v} \Rightarrow \dot{l}_2$

$\dot{w} \Rightarrow \dot{l}_3$

$$\dot{l}_1 = \frac{1}{m} F_{bx} - (q l_3 - r l_2)$$

$$\dot{l}_2 = \frac{1}{m} F_{by} - (r l_1 - p l_3)$$

$$\dot{l}_3 = \frac{1}{m} F_{bz} - (p l_2 - q l_1)$$