2.11 Moving atmosphere equations in body axes.

$$\bar{V}_o = \bar{V} + \bar{\omega}$$

$$\frac{d\bar{E}_o}{dt} = \bar{V}_o = \dot{\bar{V}} + \dot{\bar{\omega}}, \qquad \bar{V} = u\bar{\imath}_b + W\bar{k}_b$$

$$\dot{x}\bar{\imath} - \dot{h}\bar{k} = u(\cos\Theta\,\bar{\imath} - \sin\Theta\,\bar{k}) + W(\sin\Theta\,\bar{\imath} + \cos\Theta\,\bar{k})$$

$$+ \omega_x\,\bar{\imath} - \omega_h\,\bar{k}$$

$$* \qquad \dot{x} = u\cos\Theta + W\sin\Theta + \omega_x$$

$$* \qquad \dot{h} = u\sin\Theta - W\cos\Theta + \omega_h$$

$$\bar{F} = m\bar{a}_o = m(\dot{\bar{V}} + \dot{\bar{\omega}})$$

$$\bar{V} = u\bar{\imath}_b + W\bar{k}_b \qquad \dot{\bar{\omega}} = \dot{\omega}_x\,\bar{\imath} - \dot{\omega}_h\,\bar{k}$$

$$\dot{\bar{V}} = (\dot{u} + W\dot{\Theta})\,\bar{\imath}_b + (\dot{W} - u\dot{\Theta})\,\bar{k}_b \qquad \text{Sec. 10.1.2}$$

$$\bar{F} = [T\cos\varepsilon_o + L\sin\alpha - D\cos\alpha - mg\sin\Theta]\,\bar{\imath}_b \qquad \text{Sec. 10.1.2}$$

$$+ [-T\sin\varepsilon_o - L\cos\alpha - D\sin\alpha + mg\cos\Theta]\,\bar{k}_b$$

$$\dot{\bar{\omega}} = \dot{\omega}_x(\cos\Theta\,\bar{\imath}_b + \sin\Theta\,\bar{k}_b)$$

$$-\dot{\omega}_h(-\sin\Theta\,\bar{\imath}_b + \cos\Theta\,\bar{k}_b)$$

$$\dot{u} = -WQ + \frac{1}{m}[T\cos\varepsilon_o + L\sin\alpha - D\cos\alpha - mg\sin\Theta]$$

$$- \dot{\omega}_x\cos\Theta - \dot{\omega}_h\sin\Theta$$

$$\dot{W} = uQ - \frac{1}{m}[T\sin\varepsilon_o + L\cos\alpha + D\sin\alpha - mg\cos\Theta]$$

$$- \dot{\omega}_x\sin\Theta + \dot{\omega}_h\cos\Theta$$

$$\dot{\Theta} = Q$$