$$F_6 = \frac{1}{\cos(x_5)} \times \sin(u_3) \times \left\{ \frac{1}{x_4 m} \left(u_1 \sin(u_2) + \frac{1}{2} \rho(x_3) x_4^2 S C_L(u_2) \right) \right]$$

$$F_6 = \frac{\sin(u_3)}{\cos(x_5)} \left(\frac{F_5 + g\frac{\cos(x_5)}{x_4}}{\cos(u_3)} \right) = \tan(u_3) \left(\underbrace{\frac{F_5}{\cos x_5}}_{} + \frac{g}{x_4} \right)$$

$$\underset{F_6^1}{\Big\downarrow} \qquad \underset{F_6^2}{\underbrace{\qquad\qquad}}$$

$$\frac{\partial F_6}{\partial u_3}\bigg|_{at\ x_{eq},\ u_{eq}} = \frac{1}{\cos^2(u_3)} \left(\frac{F_5}{\cos x_5} + \frac{g}{x_4} \right) + \frac{\tan(u_3)}{\cos x_5} \frac{\partial F_5}{\partial u_3}\bigg|_{at\ x_{eq},\ u_{eq}}$$

$$u_{3eq} = 0 \;\Rightarrow\; \cos^2(u_{3eq}) = 1 \;;\; \Rightarrow \tan(u_{3eq}) = 0$$
$$x_{5eq} = 0 \;\Rightarrow\; \cos(x_{5eq}) = 1$$

$$\frac{\partial F_6}{\partial u_3}\bigg|_{at\ x_{eq},\ u_{eq}} = \left(\cancel{F_{5eq}}^{\ 0} + \frac{g}{x_{4eq}} \right) + \cancel{\tan(u_{3eq})}^{\ 0} \frac{\partial F_5}{\partial u_3}\bigg|_{at\ x_{eq},\ u_{eq}} \cdot \frac{1}{\cancel{\cos(x_{5eq})}^{\ 1}}$$

$$\frac{\partial F_6}{\partial u_1} = \frac{g}{x_{4eq}}$$

$$\bigoplus \qquad \boxed{B_{63} = \frac{g}{x_{4eq}}}$$