a) \[ T = \dot{m} (u_e - u_0) = 150(200 - 60) = 21 \text{ kN} \]

b) \[ T = \dot{m} (0 - u_0) = 150(-60) = 9 \text{ kN} \]

c) When airplane comes to rest, there is no net force in the x-dir. You can see this by drawing the control volume large relative to the engine.

d) Integral momentum theorem in frame attached to vehicle:

\[ \sum F_y - F_{y0} = \left( \frac{d}{dt} \left( \rho \dot{u}_y \right) \right) dV + \int_{\text{inlet}} \left( \rho u_y \hat{u} \cdot \hat{n} \right) dA \]

Assume steady.
Assume no accel. of coord. frame.

\[ \sum F_y = \int_{\text{inlet}} \left( \rho \dot{u}_y \hat{u} \cdot \hat{n} \right) dA + \int_{\text{exit}} \left( \rho u_y \hat{u} \cdot \hat{n} \right) dA \]

\[ F_y = -p A_e u_e^2 \sin \alpha \]