from C.D.L.

a) $0.4\ \text{hp} \cdot 745.7\ \text{W/hp} = \boxed{298.3\ \text{W}}$

$298.3\ \text{W} / (1.356\ \text{W/ft-lb/s}) = \boxed{220.0\ \text{ft-lb/s}}$

b) heat flow $\dot{H} = 3 \cdot \text{Power} = 894.9\ \text{W}$

heat capacity of water $c = 4.2\ \text{J/g}\cdot^\circ\text{K} = 4200\ \text{J/kg}\cdot^\circ\text{K}$

typical body mass $m = 70\ \text{kg}$ (155 lb)

rate of temperature increase $\dot{T} = \dfrac{\dot{H}}{mc} = \dfrac{894.9\ \text{W}}{70\ \text{kg} \cdot 4200\ \text{J/kg}^\circ\text{K}} = 0.003^\circ\text{K/s}$ (J/s)

Human body can't tolerate more than a few degrees of temperature rise.

Say $\Delta T_{max} = 3^\circ\text{K} = \dot{T}\,\Delta t_{max}$

$\Rightarrow \Delta t_{max} = \dfrac{\Delta T_{max}}{\dot{T}} = \dfrac{3^\circ\text{K}}{0.003^\circ\text{K/s}} = \boxed{1000\ \text{s} = 16.7\ \text{minutes}}$

c) dimensions, using SI units for example:

$\rho \sim \text{kg/m}^3$, $V \sim \text{m/s}$, $S \sim \text{m}^2$, $c \sim \text{m}$

$L \sim N = \text{kg}\cdot\text{m/s}^2$ (force), $M \sim \text{N-m} = \text{kg m}^2/\text{s}^2$ (moment)

equation: $L = \frac{1}{2}\rho V^2 S C_L$

units → $\underbrace{\text{kg m/s}^2}_{\text{same}} \sim (\text{kg/m}^3)(\text{m/s})^2\,\text{m}^2\,C_L \sim \underbrace{\text{kg m/s}^2}_{\text{same}}\,C_L$

so $\boxed{C_L \text{ is dimensionless}}$

equation: $M = \frac{1}{2}\rho V^2 S c\, C_M$

units → $\text{kg}\cdot\text{m}^2/\text{s}^2 \sim (\text{kg/m}^3)(\text{m/s})^2\,\text{m}^2\,\text{m}\,C_M \sim \text{kg m}^2/\text{s}^2\,C_M$

so $\boxed{C_M \text{ is dimensionless}}$

d) geometric dimensions scaled by 1/2, with same airflow

$\rho \to \rho$ same, $V \to V$ same, $S \to \frac{1}{4}S$, $c \to \frac{1}{2}c$, C_L, C_m same

so $\boxed{L \to \frac{1}{4}L}$, $\boxed{M \to \frac{1}{8}M}$