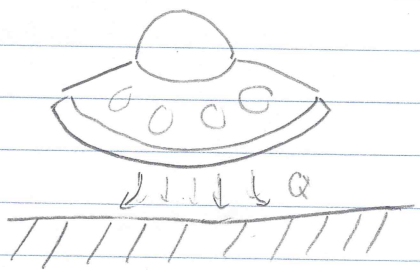
20-P-MOM-DY-31

A $m = 1000\,kg$ UFO consists of a single fan that pushes air downwards. The fan moves air at a volumetric rate $Q = 1\,m^3/s$. Assuming the density of air is $\rho = 1.22\,kg/m^3$, determine the velocity that the air has to travel at to lift the UFO off the ground.



$$\Sigma F_y : F_A - mg = 0 \qquad F_A = mg$$

$$\Sigma F_A = \frac{dm}{dt}(v_{IJ} - v_A) \qquad v_{IJ} = 0$$

$$= \frac{dm}{dt} = \rho Q$$

$$\Sigma F_A = -\rho Q v_A \qquad = \rho Q v_A \uparrow$$

$$v_A = \frac{mg}{\rho Q} = 8040.98\ m/s$$