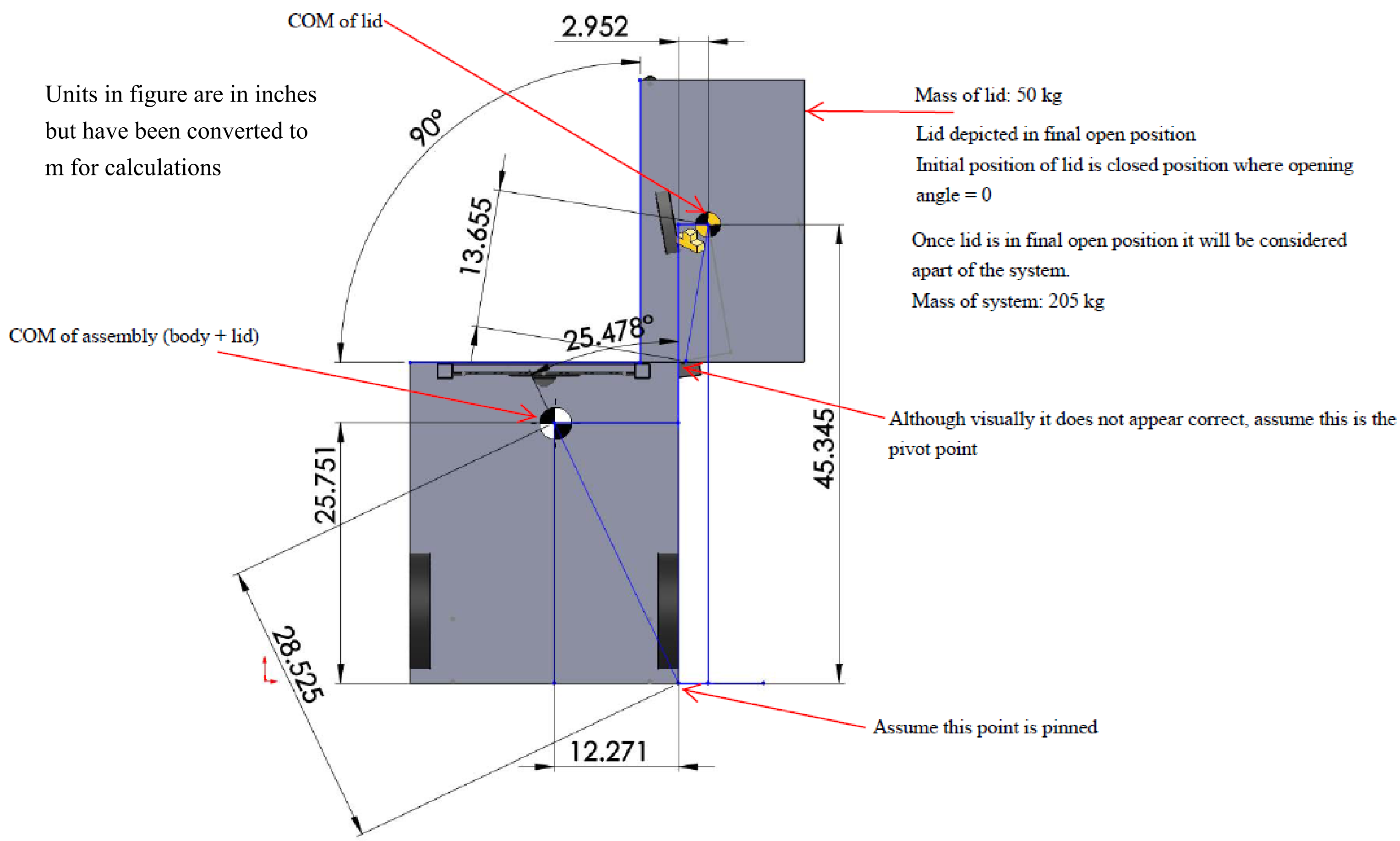
Problem: How fast does lid need to be moving to cause container to tip over?

Assumptions:
Distance lid COM travels after impact: 0.000254m (0.010 inches)

Original assembly has been "masked," a rough concept is provided below



Time to fling lid to open position @ 90 degree is 1 sec
=1 rev in 4 sec
=0.25 rev/sec
=1.57 rad/sec (angular velocity)
=1.57 * 0.347m = .545 m/s (linear velocity of lid at moment of impact)

Calculate Force of lid at impact using W=Fd

Equiv: $F = \frac{KE}{d}$

Equiv: $F = \frac{\frac{1}{2}mv^2}{d}$

F=29,235 N of lid at impact
Impulse of lid, assume 0.1 seconds = approx. 2924 N*s
Approach 1: Use Impulse and Angular Momentum

$$F_{net}\Delta t = \Delta p * R \quad , \quad Angular\ momentum = linear\ momentum * R$$

$$F_{net}\Delta t = m * \frac{d}{t} * R$$

A few questions at this point:
1) Is this on the right path?
2) The Δt on the lhs is the total time the F_{net} is acting on the system correct?
3) What exactly is the t on the rhs?
4) I assume I would solve for d on the rhs but what distance is this referring to since this is angular now, arc length?

Approach 2:
Conservation of momentum
Linear momentum of lid

$$p = m * v$$

P= 50 * .545 = 27.25 kg*m/s
Convert to angular momentum, use 45.345 in or 1.15 m from anchor
L = 31.34 $\frac{kg*m^2}{s}$
I could equate this to the angular momentum of the system and solve for velocity and that would tell me what the initial velocity of the system is after impact correct? However, the velocity will not be constant so this isn't very helpful.

Approach 3:
Using conservation of energy
At first only lid has KE and after impact system has PE; Solve for v_L and compare to velocity found in part 1
KE=PE

$$\frac{1}{2}m_L{v_L}^2 = m_s g(h_2 - h_1)\ ,$$

$$m_l = mass\ of\ lid$$

$$m_s = mass\ system$$

$$h_1 = Height\ of\ system\ COM\ initially$$

$$h_2 = Height\ of\ system\ COM\ at\ peak\ (right\ before\ tipping)$$

Solve: $\frac{1}{2}(50){v_L}^2 = 205(9.8)(0.07)$
V=2.37 m/s : Does this mean the lid with mass 50kg would have to be at a constant speed of 2.37 m/s to tip the entire assembly? Comparing this to the actual speed of the lid it appears the assembly wont tip however, the velocity of the lid will not be constant.; it will impact and stop.

I need to relate the impulse of the lid to the change of angular position of the system COM over time. The COM of the system will follow an arc until it reaches the tipping point, how do I equate the torque caused by the impact of the lid to the change in angular position wrt time of the system COM.