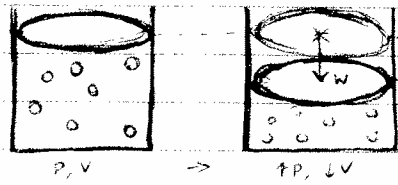


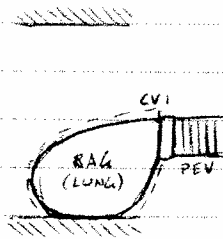
PROOF OF CONCEPT

Boyle's Law: Pressure is inversely related to volume (@ constant temperature)



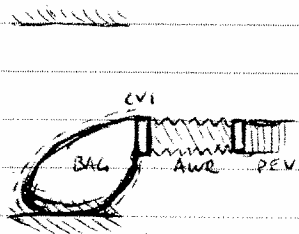
Pressure exerted on lungs is isometric and will be accomplished most realistically by a fluid.

We wish to apply pressure to a bag representing the lungs in such a way that the resistance to ventilation is consistent with what is expected in human subjects.



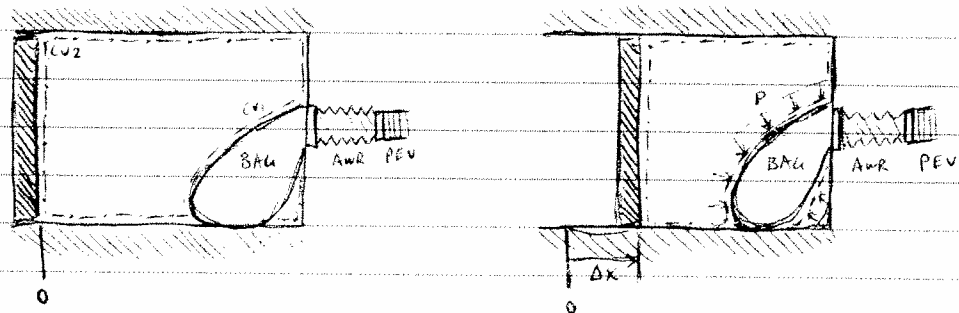
To avoid needless scaling of inputs and outputs, the lung should be sized for upperbound adults (90 ml/kg) and also for lowerbound neonates (50 ml/kg). [See Page 20]

Additionally, there must be some resistance to the inflation of the lung which diminishes flow at its outlet in a way analogous to airway resistance in trachea (AWR). This is particularly important for neonatal functionality as neonates rely on greater AWR due to high chest wall compliance and low lung compliance [See Page 19].



Upperbound AWR: 25 cmH₂O/L/sec
Lowerbound AWR: 6 cmH₂O/L/sec
Resistance can be constructed: $\Delta P/\dot{V} = AWR$
From Fluid Mechanics [See Page 19]

Now, to apply isometric pressure to the control volume, we create a second control volume around it, a volume which can be adjusted from some equilibrium point to create pressure.



A move of Δx (assuming a rectangular prism shape for CV2) causes a predictable Pressure.

Continued to page

SIGNATURE
Danielle Koch

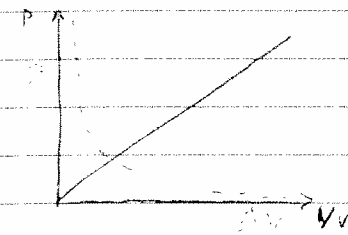
DATE
16 OCT 2013

DISCLOSED TO AND UNDERSTOOD BY

DATE

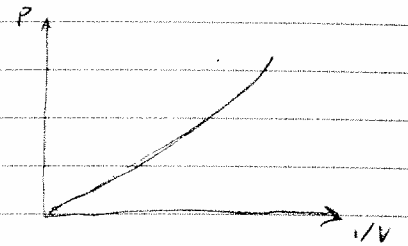
PROPRIETARY INFORMATION

So far, the load experienced by the PEV will look like this:



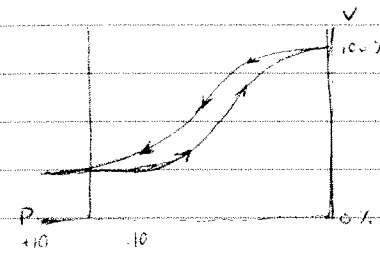
IDEAL

But the actual plot will be different because bag also exerts forces:



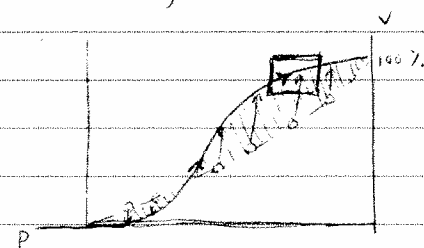
MORE LIKELY

More problematically, the lung's compliance is nonlinear and at its lowest volume experiences positive pressure [See Page 10]



This is extremely difficult to replicate in any material EXCEPT fresh lung tissue. But it could be replicated for the PEV.

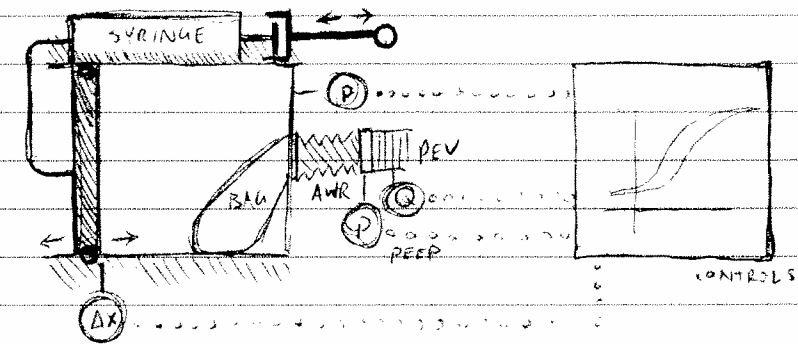
A syringe pump attached to the control volume 2 could correct by adding and removing air (pressure).



Mathematically, this would entail adding as much as the ~~derivative~~ integral of this function.



This kind of coordination would require controls and sensors to relay data:



The controls we vary in 4 modes 2 are passive, activation of s but not of movi (Manual, Autose 2 are active, req moving wall act and syringe (Assis Continued to

NOTE COULD REMOVE MOVING WALL FOR STATIONARY AND COMPENSATE WITH LARGER PUMP

SIGNATURE
Danielle Koch

DATE
16 OCT 2013

DISCLOSED TO AND UNDERSTOOD BY

DATE

PROPRIETARY INFORM