

PEV Performance Verification System - Team 14026

Kristeen Yee - Team Leader,
Stephanie Zambito, Soham
Chakraborty, Leslie Havens,
Danielle Koch, Mike Allocco,
Andrew Miller

Agenda

- Project Background
- Problem Statement & Project Deliverables
- Use Scenarios
- Benchmarking of other testers
- Prioritized Needs
- Engineering Requirements
- Draft of Project Plans

What is a PEV?

- Portable Emergency Ventilator that provides positive pressure to a person that is incapable of breathing on their own.



Previous PEV Prototypes

- MEDIRESP III
 - Portable ventilator that does not use an oxygen tank
 - 4 modes of air flow
- MEDIRESP IV
 - A digital system
- MEDIRESP V
 - Attempting to make it lighter, more compact, and user friendly

Problem Statement

- Current State
 - 1st generation of a verification system
- Desired State
 - Simulate the respiratory system and measure flow, pressure, volume, and oxygen concentration
- Project Goals/Opportunities
 - Collect data to evaluate PEV prototypes
 - Develop database of analytic results
- Constraints
 - ANSI Z79.7 - Standards for Breathing Machines for Medical Use
 - ISO 5469:1967 - Adult lung and Infant lung
 - ASTM F 1100-90 - Ventilators Intended for Use in Critical Care

Project Deliverables

- Functional test fixture that simulates an active lung
- Test data verifying operation
- Design alternatives:
 - Calibration techniques

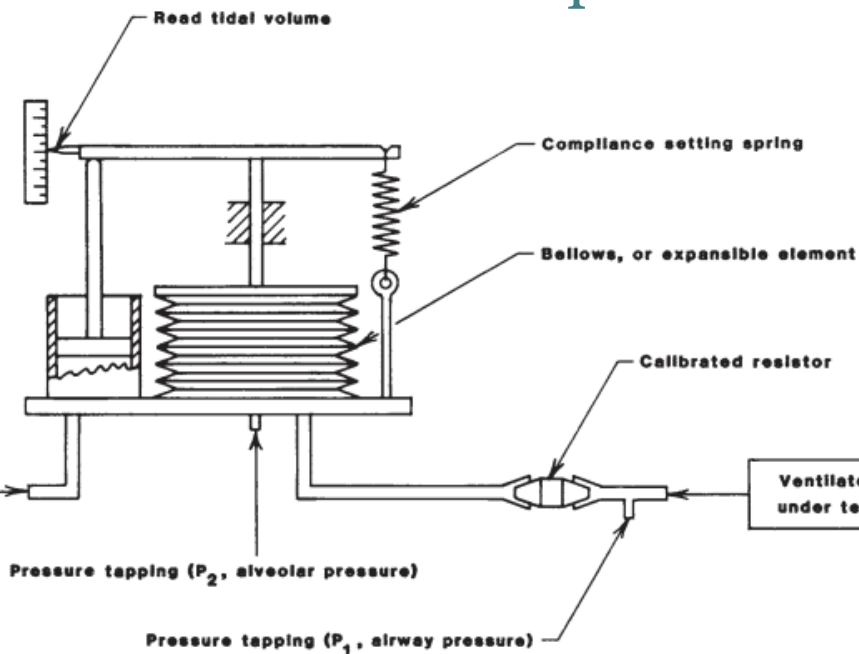


FIG. 3 Representative Active Lung Model

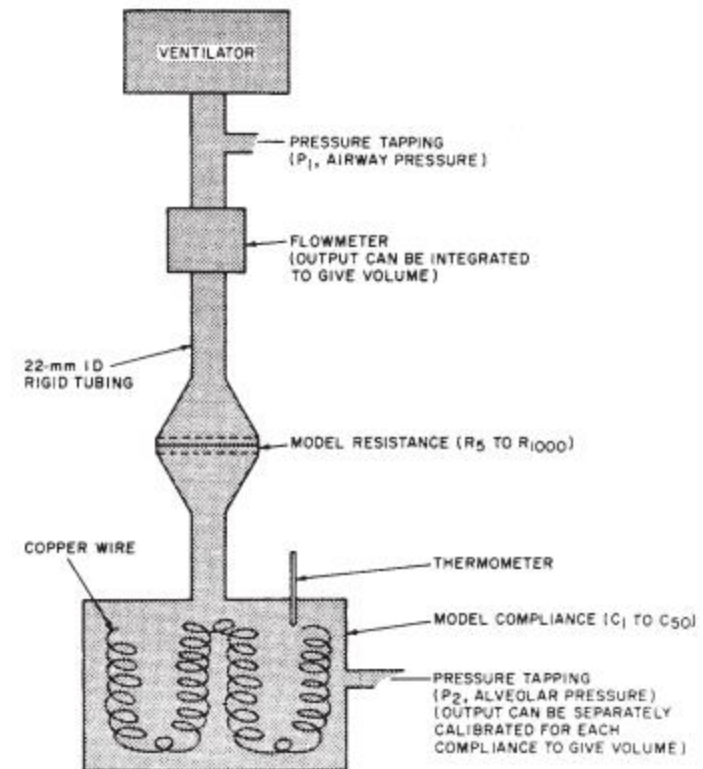


FIG. 2 Representative Passive Lung Model

Stakeholders

- Hospitals
- First responders
- Doctors
- Jeff Gutterman
- Dr. Roman Press
- Mary Murphy
- Ed Hanzlik
- MSD Team 13027
- MSD Team 14026



Use Scenarios Considered

- Scenario 1: To test the prototypes of the different PEV's
- Scenario 2: Potential use for quality control in a manufacturing setting

Benchmarking Other Testers

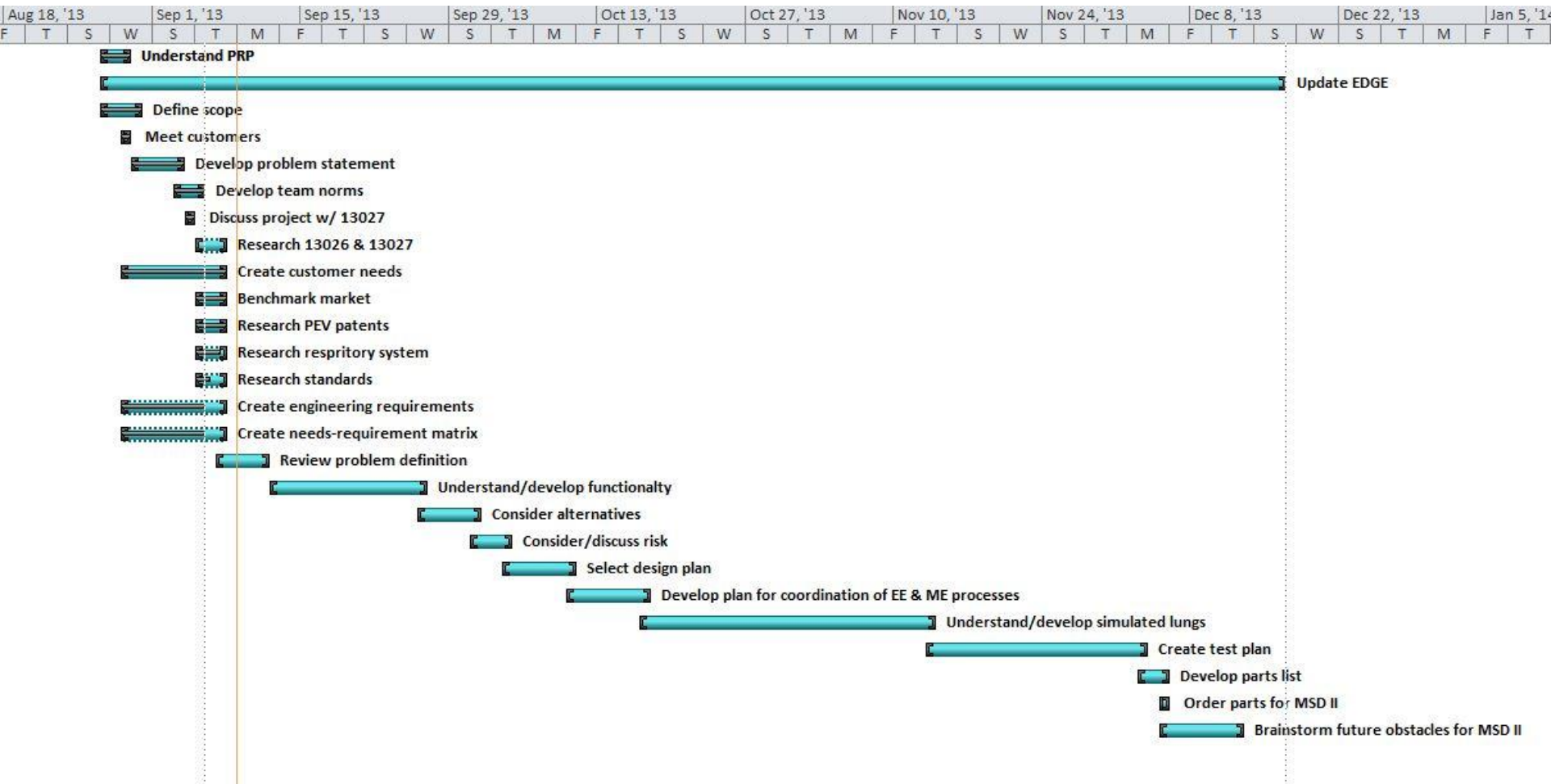
- CITREX H4
 - mobile & useful for production plants
 - completely digital
- FlowAnalyser PF-300
 - measures PEEP and peak pressures
 - more bulky than CITREX but also more powerful
 - \$7650
- Certifier FA Plus Ventilator Test System 4080
 - measures air, O₂, Air/O₂ mixture, N₂, CO₂, and N₂O
 - neonatal to adult, and high frequency breathing
 - \$3465



Matrix

Needs	Priority	Engineering Requirements												
		Air Pressure	Lung Compliance	Resistance of Trachea & Lung	Rate of air intake	PEEP level	Tidal Volume	Inhaler/Exhale Ratio	Maximum lung volume	Flow rate	Minimum Oxygen Concentration	Maximum Carbon Dioxide Concentration	Expense of parts	Weight
Adjustable Lung Compliance	9	X	X				X		X					
Adjustable Trachea and Lung Resistance	3	X		X	X					X				
Measures Respiratory Rate	9				X			X						
Measures that air pressure is always at PEEP level	9	X				X								
Adjustable Tidal Volume Capacity	3	X	X	X	X		X							
Measures Inspiration/Exhalation Ratio	9				X			X						
Measures pressure levels	9	X		X		X	X		X					
Measures max lung volume	9		X				X		X					
Measures flow rates	9			X	X			X	X					
Displays pressure-volume curve	3	X		X	X	X	X		X					
Measures oxygen concentration	9									X				
Measures carbon dioxide concentration	3										X			
Minimizes expenses	3											X	X	
Units of Measure		cm H2O	L/cm H2O	cm H2O/L/sec	breaths/min	PSI	mL	unit less	L	L/sec	ppm	ppm	Dollars	kg

Preliminary Schedule



Issues & Corrective Actions

- Research respiratory system in depth
 - Meet with Dr Doolittle
 - Planned meeting on Friday, Sept 20
 - Library & Literature Research
 - Books from Risa Robinson
 - Keep open communication with Mr Hanzlik for standards research
- Develop Work Breakdown Structure
 - Determine strengths of team members
 - Determine subsections of project development
- Develop Risk Management
 - Develop FMEA table