

## ***Human Respiratory Mechanics Demonstration Model, Project 26***

**CLIENTS:** Dr. Andrew Lokuta, Dr. Kevin Strang

**TEAM MEMBERS:** Janelle Anderson (Co-Leader)  
Malini Soundarrajan (Co-Leader)  
Chris Goplen (Communicator)  
Lynn Murray (BWIG)  
Kristen Seashore (BSAC)

**DATES:** 12/7/07 to 12/13/07

### **PROBLEM STATEMENT:**

Currently, a basic balloon and latex membrane model is being used to represent the lungs, and diaphragm, respectively for classroom instructional purposes. While they demonstrate respiratory mechanics, the models have a short lifespan and do not display alveolar and intrapleural pressure changes. Further, current models do not accurately depict the anatomical scaling of the lungs with respect to the thoracic cavity.

Our goal is to design and build an adequate mechanical respiratory model for class instruction purposes. This model should demonstrate relative pressure differences between alveolar and intrapleural spaces. It must further demonstrate the expansion of the thoracic cavity from the rib cage as well as the diaphragm, thereby displaying a 3-D expansion. The scaling of the lungs relative to the size of the thoracic cavity enclosure should be more anatomically correct. The device must be portable and small enough to use with a document camera.

### **RESTATEMENT OF PREVIOUS WEEK'S TEAM GOALS:**

At the end of this week, we will epoxy all the individual drilled acrylic pieces and assemble our prototype. We will then test the Theraband®, latex, and gum rubber materials used in the lungs and the rib membrane using the tensile testing machine, Instron 1000. After assembling the device, we will run several trials to determine pressure changes achieved for given volume and displacement changes from the piston and the rib membrane. Finally, we will finish working on our paper, update the PDS, complete work on our poster and practice for the final presentation.

### **INDIVIDUAL GOALS FOR NEXT WEEK:**

**Janelle Anderson:** Meet with client to get feedback and discuss plans for next semester.

**Malini Soundarrajan:** Meet with client to get feedback and discuss plans for next semester.

**Chris Goplen:** Meet with client to get feedback and discuss plans for next semester.

**Lynn Murray:** Meet with client to get feedback and discuss plans for next semester.

**Kristen Seashore:** Meet with client to get feedback and discuss plans for next semester.

**SUMMARY OF ACCOMPLISHMENTS:**

- Team members presented the project at the poster session.
- All teammates met to edit the final paper and complete the client evaluation.

**STATEMENT OF THIS WEEK’S TEAM GOALS:**

At the end of the week, we will meet with our clients to get feedback on the prototype. We will also hand over the model to our clients, and discuss plans for continuing the project next semester.

**PROJECT SCHEDULE:**

We have scheduled a meeting with our clients for 12/14/07 to get their input on our model and to determine project goals for next semester.

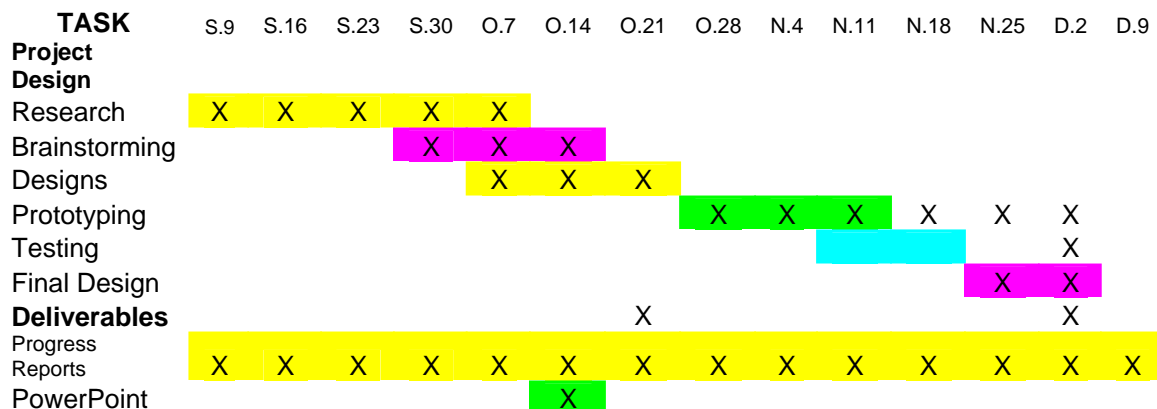
**DIFFICULTIES:**

No difficulties this week.

**ACTIVITIES:**

Date	Description	Time
12/8	Janelle updated her notebook	30 min
12/10	Janelle updated her notebook	1.25 hrs
12/10	All team members met to edit the final paper and complete client evaluation	2 hrs
12/10	Janelle completed self/peer evaluation	30 min
12/10	Malini completed self/peer evaluation	1 hr
12/11	Malini wrote last section of the paper	1 hr
12/12	Kristen updated her notebook	1 hr
12/13	Kristen completed self/peer evaluation	1 hr
12/13	Malini wrote the progress report	1 hr
<b>TOTAL HOURS THIS WEEK:</b>		<b>9.25 hrs</b>

**PROJECT TIME LINE:**



PDS	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Final Presentation															X
Design Report														X	X
<b>Meetings</b>															
Client	X			X											
Team	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Professor		X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Website</b>				X	X	X	X	X	X	X	X	X	X	X	X

**EXPENSES:**

Description	Manufacturer	Part Number	Qty	Price (each)	Price (Tot)
8" outer diameter acrylic tube (thickness= 3/16")	McMaster-Carr	8486K837	1	\$41.40	\$41.40
5" outer diameter acrylic tube (t= 1/4")	McMaster-Carr	8486K583	1	\$25.65	\$25.65
5" inner diameter acrylic tube (t= 1/8")	McMaster-Carr	8486K582	1	\$21.35	\$21.35
Silicone Adhesive (3.0 oz)	McMaster-Carr	7587A37	1	\$3.37	\$3.37
Epoxy Adhesive (1.7 oz)	McMaster-Carr	7467A55	1	\$13.55	\$13.55
Hose clamps: (7/32")	McMaster-Carr	5388K14	1	\$4.68	\$4.68
Tube-to-tube Y fitting (3/8")	McMaster-Carr	53415K241	1	\$14.29	\$14.29
12"x12"Acrylic Sheet (t= .177")	McMaster-Carr	8560K211	4	\$5.05	\$20.20
O-ring (diameter = 5")	McMaster-Carr	9452K352	1	\$4.90	\$4.90
Rubber stopper with through hole (13/64"), size 7	McMaster-Carr	9545K33	1	\$11.05	\$11.05
Compound Pressure Gauge 0 to -30"Hg/0-15psi	McMaster-Carr	3941K53	2	\$9.37	\$18.74
Natural Latex (t= .008") by yd.	McMaster-Carr	85995K13	2	\$2.31	\$4.62
8" diameter acrylic tube (thickness= 1/4")	McMaster-Carr	8486K597	1	\$51.13	\$51.13
Polyurethane tubing: inner diameter 3/8" (t=1/16")	McMaster-Carr	5108K56	2	\$0.92	\$1.84
Helicoil (insert length =.138" thread #6-32)	McMaster-Carr	91990A219	2	\$6.36	\$12.72
Button head socket cap screws #6-32	McMaster-Carr	92949A146	1	\$6.53	\$6.53
Metal knob (1/4" -28 threads)	McMaster-Carr	6079K32	2	\$4.54	\$9.08
Piston O-ring (inner diameter = 4.125")	McMaster-Carr	9452K193	1	\$9.45	\$9.45
1/32" pure gum rubber sheet	Small Parts, Inc	PGRS-0031-F	1	\$8.55 + shipping	\$13.45
12"x12"Acrylic Sheet (t= .177")	McMaster-Carr	8560K211	4	\$5.05	\$20.20
<b>Total</b>					<b>\$ 308.20</b>