

Human Respiratory Mechanics Demonstration Model, Project 26

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

DATES: 11/2/07 to 11/08/07

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:

Continue prototype construction, develop ideas for testing, get client feedback, and work on final paper.

INDIVIDUAL GOALS FOR NEXT WEEK:

Janelle Anderson: check out local acrylic machining places; construct prototype

Malini Soundarrajan: start testing balloon materials; continue prototyping

Chris Goplen: Get remaining parts; continue prototyping

Lynn Murray: Get new parts; finalize remaining materials

Kristen Seashore: Continue prototyping; test balloon materials

SUMMARY OF ACCOMPLISHMENTS:

- Chris and Janelle did more prototype construction.
- Team met to finalize design details for the rib cage mechanism and attachments for pressure gauges.
- Team finalized materials and placed another order at McMaster.

STATEMENT OF THIS WEEK'S TEAM GOALS:

Once our parts arrive, continue constructing the prototype. Begin testing balloon materials and develop design testing methods.

PROJECT SCHEDULE:

This week, we will continue constructing our prototype and developing test methods for the finished device.

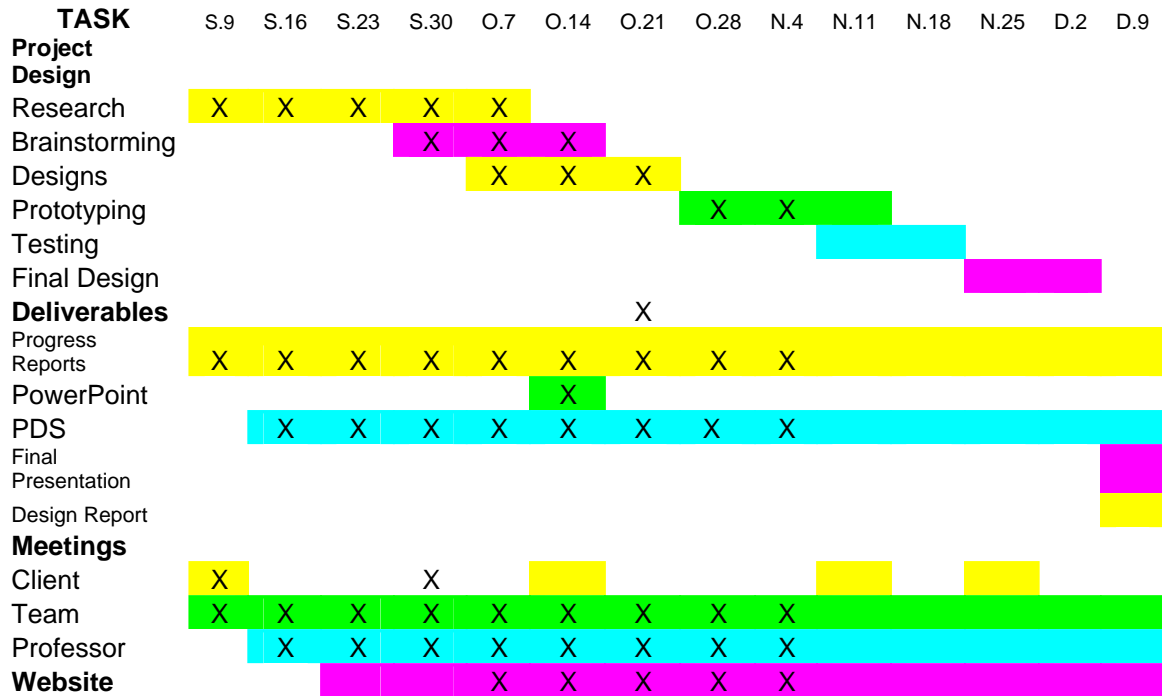
DIFFICULTIES:

We experienced difficulties machining our acrylic tubes on the lathe. Our large acrylic tube shattered into pieces; we re-ordered a new, slightly thicker tube and will either have it machined by an acrylic custom machining company if the cost isn't too large or try a different approach to cutting the tube ourselves. Our small acrylic tube also flew off the lathe, but was only scraped slightly and had a miniscule chip taken out of it.

ACTIVITIES:

Date	Description	Time
11/2	Chris and Janelle cut acrylic pieces and modified rubber stopper for prototype	2 hr
11/2	Janelle researched materials	1 hr
11/2	Lynn updated the website	20 min
11/3	Janelle updated design notebook	20 min
11/3	Lynn researched materials	20 min
11/5	Lynn worked with the Website Task Force	45 min
11/5	All team members met to finalize design aspects and finish ordering remaining materials needed	2.5 hr
11/5	Chris ordered parts	30 min
11/6	Chris researched machining options	15 min
11/6	Kristen researching materials and machining options	45 min
11/8	Janelle wrote the progress report	1 hr
TOTAL HOURS THIS WEEK:		9.75 hrs

PROJECT TIME LINE:



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	3	\$5.05	\$15.15
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
Total					\$ 269.50