

Project Title: Esophageal Simulator

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Function: Eso-Technologies is currently in the process of developing a pressure sensing device that will measure the cardiac pressure from the left atrium. Because they have limited testing sessions on patients, they have requested that a pressure simulator be constructed. The device needs to have a programmable pump that can reproduce and vary the frequency and size of the pressures generated by the heart, lungs, and esophagus.

Client requirements: Shown below are the required pressure ranges.

Left Atrium	0-30 mmHg	40-140 per min
Chest Cavity	-10-30 cmH2O	0-20 per min
Esophagus (static)	0-50 mmHg	Constant
Esophagus (dynamic)	0-100 mmHg	0-10 per min

In addition to this, the device must be able to independently read the pressures to provide feedback to the pump.

Design requirements:

1. Physical and Operational Characteristics

a. *Performance requirements:* The device needs to be able to produce pressure waves from the esophagus, heart, and lungs. The pressure waves must also be able to be varied in both magnitude and frequency.

b. *Accuracy and Reliability:* It is very important that the pressures exerted on the probe are correct. In order to do this, real measurement provided by Eso-Technologies will be programmed into the system. In addition there will need to be an external pressure sensor to ensure the correct pressure and to provide feedback when necessary.

c. *Life in Service:* The device will be used as new developments of the probe occur and need to be tested.

d. *Shelf Life:* During normal use, the device will last very long. However, different materials will likely be placed into the tube to simulate the esophagus.

e. *Operating Environment*: The system will be used in a lab. It will not need any special materials to prevent wear and tear from the environment.

f. *Size*: The pressure tube will likely be a small size, because a small contact point is needed for the probe. In order to be portable, a laptop computer could be used as the source of the pump information

g. *Materials*: The material in the tube should mimic the esophagus, as the probe will be placed in the esophagus. Currently a penrose drain is a suitable option for this.

2. Production Characteristics

a. *Quantity*: There is a need for one system, with an option to replace the material inside the tube.

b. *Target Product Cost*: The budget is allowed up to \$500

3. Miscellaneous

a. *Competition*: Currently there is no device that reproduces pressures in order to test an esophageal probe