

## Appendix B

### Product Design Specification

**Function:** A creative cycle ergometer that is usable by individuals with a diversity of abilities.

**Client Requirements:**

Joan –

Born in 1919, Joan has raised 5 children and has many grandchildren and great-grandchildren. Now a widow and living in a convalescent home with heart failure, she is relatively sedentary and is fragile and weak.

Lloyd –

Lloyd, a retired pharmacist, was born in 1926. Diagnosed with Type 2 Diabetes in 1989, Lloyd has poor eyesight and, due to poor diet and lack of exercise, is very overweight (400lbs).

Sophia –

Sophia was born in 1920 and emigrated to the U.S. from Poland in 1937. In relatively good health, Sophia suffered a stroke in 2002. She had several small strokes in 2003, and now takes heparin as a precautionary measure. She has limited right arm function, walks using a cane, and needs an exercise bike that is more stable.

Arnold –

Arnold was born in 1952 and works as a janitor in a large manufacturing company. He has diabetes and Parkinson's disease, and experiences slight to moderate tremors.

Wanda –

Born in 1994, Wanda is deaf and has diabetes. Wanda weighs 80 lbs. She is being encouraged to start administering insulin to herself, as her mother recently passed away and her father, Bob, is blind. She and her father would like to start an aerobic exercise routine together.

Bob –

Born in 1956, Bob is blind and works as an accountant for the State of Connecticut. His weight fluctuates a lot, and he likes to stay fit by exercising on a cycle ergometer. With the recent death of his wife, Bob would prefer to exercise less at the local YMCA more with his daughter, Wanda, at home.

## Design Requirements:

### 1. Physical and Operational Characteristics:

a. *Performance requirements:* The device will be used by a variety of individuals with various disabilities for aerobic workouts 3 to 5 times per week. The device must be able to support from 80 to 400 lbs. The device should measure client's heart rate.

b. *Safety:* The device must meet all clients' disability needs. The design should comply with the Principles of Universal Design. The material used for the device must be able to support each client and withstand the force required to turn the flywheel and move the arm bars.

c. *Accuracy and Reliability:* The measurement of the heart rate should be within +/- 3 beats. The measurement of the number of calories burned should be within +/- 10 Calories.

d. *Life in Service:* The device will be in use 3-5 days per week for 30-60 minutes and approximately 1200 revolutions per use.

e. *Shelf Life:* The device will be able to be stored for up to 10 years at room temperature.

f. *Operating Environment:* The device will be used by people ranging in weight from 80 to 400 lbs. The device will be used in a home exercise environment and will be subject to common household dirt and dust at a temperature range of 64°F to 78°F.

g. *Ergonomics:* The device must be accessible for people with a variety of disabilities indicated above. The device chair must be less than 3 feet high. The handles must be easily reached when sitting in the chair. The force required to pedal and to move the arm handles must be small enough to allow each person to use the device.

h. *Weight:* The device must be light enough to be able to be transported, yet heavy enough to provide stability.

i. *Materials:* The materials used in the device must be able to support the client weight and the force each client imparts on the device.

j. *Aesthetics, Appearance, and Finish:* The device should look appealing and non-threatening.

### 2. Production Characteristics

a. *Quantity:* 1 unit is needed.

b. *Target Product Cost:* \$1000

### **3. Miscellaneous**

a. *Standards and Specifications:* The device must follow the Principles of Universal Design. For human testing, the HIPPA guidelines must be followed and a Certification of Completion of Human Subjects Protection Training must be obtained.

b. *Customer:* The device should be aesthetically pleasing for in home usage.

c. *Patient-related Concerns:* The design of the device must address all of the client requirements/disabilities.

d. *Competition:* There are many varieties of exercise equipment available at retail stores, but none of them address every disability of our clients. Other groups are also designing a device for the same clients.