

## Appendix A

### 2004-2005 National Student Design Competition

**Open to programs in biomedical engineering, industrial design, and others.**

**Programs receive up to \$2000 in reimbursement for design costs.**

**First prize: \$1000, Second prize: \$750, Third prize: \$500.**

**Also \$500 award for registration/travel to present a related paper accepted at a major conference.**

Contact: John Enderle, Ph.D., e-mail: [jenderle@bme.uconn.edu](mailto:jenderle@bme.uconn.edu), phone: 860-486-5521

#### **Accessible Ergometer:**

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

*Specs:* It must be easy to get into, feel stable, be easy to adjust even with low strength or flexibility, have an easy-to-view display, and be targeted for under \$1000 retail. (Can start with existing unit, if less than \$500 retail.)

*Clients:* Joan, Lloyd, Sophia, Arnold, Wanda, Bob

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**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.

## Contest Rules

At least 10 projects will be funded each year; the projects can be started during the Fall or Spring semester and take 1 or 2 semesters to complete the design. Projects are considered on a first come basis starting early September of each year, with early submission advised. A university/school may submit up to three team projects, one in each design area, for the competition. Participating in this competition does not eliminate participation in other programs.

To enter the competition, the student team and faculty advisor submit an email letter of intent to: Dr. John D. Enderle, University of Connecticut, Email: [jenderle@bme.uconn.edu](mailto:jenderle@bme.uconn.edu), Phone: (860) 486-5521

The one-page letter of intent should briefly describe the project and how the team proposes to design the project, the completion date, and contact information for the faculty advisor and team members. Evaluation of the proposals will be carried out as they are received, with a response provided within two weeks of submission. Student teams accepted into the competition will receive reimbursements up to \$2,000 for the project. To receive the reimbursement, the faculty advisor sends the request to Dr. John Enderle with original receipts, in roughly \$500 increments. An “up front” request for an initial \$500 can be made, subject to there being a university account for these funds and a promise of subsequent documentation. The money provided by the RERC on AMI is intended to build a working prototype of the device. No other money may be used to support the project, without prior approval by Dr. Enderle.

For the competition, each team will create a website that will be used to evaluate the design and to help select the winners of the competition. At a minimum, the website should contain a final report, detailed photos and a digital video clip of the project in action. The final report should fully describe the project including detailed drawings and photographs, full engineering analysis of optimal design and at least one alternative design, consideration of accessible design principles and how the design addresses the needs of the hypothetical clients, and all expenses to build the prototype and a projected cost to produce a manufactured product. For full credit, the project should be tested with representative intended users, with feedback used to improve the project. Appropriate terminology should be used when dealing with disability and assistive technologies (see <http://www.lsi.ku.edu/lsi/internal/guidelines.html>). The website should be easy to view and navigate from page to page, and follow web accessibility guidelines (<http://www.w3.org/WAI/>). The projects will be evaluated at the end of each semester by a team of judges, with the winners contacted directly and the results posted at the RERC website <http://www.erc-ami.org/>. The cost to produce the project will be a factor in judging; with no project eligible if over \$2000 is used to build the prototype. The top three projects will receive for First prize: \$1000, Second prize: \$750, Third prize: \$500. Also, all entries are eligible for up to a \$500 award to cover registration/travel to present a paper on the design if it is accepted and published in proceedings at a major conference.

## Letter of Intent



THE UNIVERSITY  
of  
**WISCONSIN**  
MADISON

September 14, 2004

Dear Dr. John D. Enderle,

Our team intends to compete in the 2004-2005 National Student Design Competition. The project that we plan on undertaking is the design of an Accessible Ergometer that meets the guidelines set forth in the flyer. The project's aim is to design a cycle ergometer that is usable by individuals with a diversity of abilities that will allow them to exercise to meet their own individual health related goals. By the end of the project the team intends to have designed, built, and tested a cycle ergometer that is easily accessible, feels stable even when engaging in aerobic activity, and is easy to adjust even with low strength or flexibility. The design must also have an easy-to-view display, be retailed for under a thousand dollars and meet the individual needs of our six clients.

As a team, we propose a design that uses a Nordic Track SL 710, MSRP \$499, as our platform to build the rest of the ergometer around. Some major changes that would be made would be to make the cycle ergometer easier for people to get in and out of by reducing or eliminating the area in front the seat. The display and user interface may be completely redone in order to achieve the best design. The seat will also be redone in order to make it easier to adjust along with making it more adjustable in the four directions of importance up, down, front and back. In order to achieve a better aerobic exercise, our ergometer will incorporate an arm movement system that will work the large muscles of the chest, back, and arms. The upper body can be exercised via the use of one or both arms. Ultimately, it will allow for the user to get a better exercise. Also, a method of measuring heart rate will also be incorporated into the design in order to estimate the range of aerobic output.

Following acceptance to the competition, initial prototype construction will begin immediately and go through January 18, 2005. By this time, the team anticipates acceptance for human testing. Human testing and prototype modification will commence and continue through April 30, 2005, by which time a final prototype design will have been achieved. The anticipated submission date for the project is May 1, 2005.

Our team is composed of four Biomedical Engineering Senior students that are involved in a two semester design course with full backing of the department. Therefore, at our disposal, we have full access to all departmental resources, the TRACE center, and the UW hospital when it comes to the testing process. The team has a combined total of eight years experience of design courses, with a combined total of eleven group projects completed to date. The group consists of Jonathan Millin ([jmillin@wisc.edu](mailto:jmillin@wisc.edu)), Ryan Pope ([popper@cae.wisc.edu](mailto:poper@cae.wisc.edu)), Amit Mehta ([amitmehta@wisc.edu](mailto:amitmehta@wisc.edu)), and Jeffery Swift ([jaswift@wisc.edu](mailto:jaswift@wisc.edu)). Our departmental advisor is Professor Justin Williams ([jwilliams@engr.wisc.edu](mailto:jwilliams@engr.wisc.edu)). As a part of our course we are currently in the process of creating a more detailed design proposal that should be completed in the week to week and a half.

Thank you for your consideration,

Jon Millin  
Team Leader

Prof. Justin Williams  
Team Advisor

### Department of Biomedical Engineering

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