Rowing Biomechanics

The need:
Rowing has been gaining in interest for a number of reasons, although the understanding of injuries is much less well developed. In particular there are a number of issues that are related directly to gender differences in a number of sports. One of the most interesting areas of biomechanical research is the dynamics of the lower leg. The motion of the lower leg and associated support structures can lead to a range of injuries from ACL tears to more dramatic arterial tears. This project will look at the leg of a female rower using a rowing machine to develop a model mechanical system for the motion of the joints from the hip to the ankle. The system will be designed to investigate the role of float in the spreader for the foot hold on a rowing machine. It is hypothesized the loading on the knee, hip and lower back can be reduced by allowing a small rotation of the foot on the spreader.

The key project design objective:
The mechanical leg system must duplicate the motion of the leg in a rowing motion. This motion will then be tracked for both a fixed and rotating spreader.

Who is the final customer for this device:
This is a basic research project to understand the motion of the leg in rowing. The customer of the research will be boat designers, in particular for crew boats designed specifically for women.

Who will be supervising and evaluating the outcome of the project:
Project review will include oversight by Professor Raoul Reiser of Colorado State University, Dr. Sarah Jane Hobbs of University of Central Lancashire and a representative of a European and boat manufacturers.

UMaine Mechanical Engineering technical contact point:
Professor Peterson will supervise the mechanics, materials and manufacturing issues related to the project and will serve as an interface with outside entities. Outside technical support will be available for the evaluation of this project.

The core Mechanical Engineering classes required as background for the project:
Dynamics
Controls
Lab I & 2
Design I & II
Strength of Materials
Material Science


2 Marion J. L. Alexander, Gender Differences in Biomechanical Aspects of Performance, Critical Reviews in Physical and Rehabilitation Medicine, pages 15-36
Resources available:  
This project is unique in that a wide range of people and equipment can be provided for the project. While the applications of the technology are quite broad, the immediate support for this project is from the international equine industry.

End of year deliverables:  
The design will require a very clear design for the leg sections which is based on the typical female rower lower leg dimensions. Drawings with tolerances for manufacturing will be completed for a demonstration unit. The completion of a complete drawing package and a design of a measurement system for the full 3-d positioning of the knee during the rowing motion.