Concept
Our team selected a concept for an exercise machine, developed by Doug Brunner, that creates a comfortable simulation of the human running motion using two independent “treads” that circulate around each other in shallow loops. Each tread is connected to an array of three identical four-bar linkages, which hold it parallel to the floor. The two arrays are connected by a crank, which holds their input links 180° out of phase and connects them both to an eddy-current brake. The action of this mechanism ensures that there is always a tread in position when the user's foot comes down to begin a step, and moves nearly parallel to the ground during the “active” portion of the stroke, accurately simulating the feel of running on a flat surface.

The hazards inherent in close proximity to an operating mechanism are minimized by a polymer shroud (not shown in the drawing) that covers all parts of the mechanism except for the treads, and is designed to allow clearance near the end of the active stroke, to avoid crush injuries by body parts being caught in pinch points. Also not shown on the drawing are handholds for the user, to help maintain balance and preserve the force balance seen in running (which would otherwise be upset by the lack of wind resistance).

End User Wants and Metrics
Our target market will be medium-price-range ($500-$1000). The product will be intended for home consumers, as it will be easier to sell and will require more sales to keep the same number of people working out, compared to a gym. The customers will want a durable, lightweight, low-impact machine that can accurately simulate real running motion, with the electronic features that are present on many machines available now. Target values for the performance metrics are a weight of 75 kg, a bearing life of 1.5 million cycles (corresponding to 5 years of regular use).

Benchmarking
Our closest competition will be treadmills, of which we selected two for benchmarking purposes. The first is the SL198 home treadmill, manufactured by Spirit, and sold for $994.00 at www.beyondmoseying.com. It features a three window LED display showing time, calorie, pulse, distance, incline and speed, a pause and resume feature, five preset programs, and a remote hand rail speed and incline control; its safety features are a fifteen amp circuit breaker, tether cord (AC interrupt), wide textured belt, stop/pause switch, low speed start, twin hand rails, and grab bar. No recalls were found for this machine.

Another machine found is Horizon Fitness's Panagon treadmill, which was sold for $800-$1000. It provides an example of safety hazards associated with this type of equipment: the Panagons built during the 2000-2001 model year were recalled in April 2002, due to a malfunction that caused the belt to accelerate too quickly, making the user lose his/her balance. By the time the recall was reported, fifteen people had reported injuries as a result of this defect.

Our machine's design is inherently less susceptible to this type of hazard, since it is driven entirely by the user. In addition, the threat of loss of balance due to changing speeds is minimized by the use of long treads, which provide a large target area for the user's foot, and a low-inertia mechanism that will slow down quickly when the user reduces his/her speed.

Development and Commercialization Plan
Once the design is finalized, we will further test and develop it to make sure it meets the customer wants and design specifications; the aim of this process is to ensure that it is substantially superior to the competition. After completion of this testing phase, we will design an efficient manufacturing process for the final product, borrow necessary capital, and acquire the facilities for mass production. As shown in the attached spreadsheet, we expect a first-year unit cost of $355, with 50% markup, for a sale price of $710 per unit. Because of the relatively low price and technical merits of the product, we expect to sell 3000 units in the first year, with steadily increasing sales in future years.

Our advertising will prominently feature the accuracy of the machine's simulation of human running on a flat surface, and the resultant easy and natural feel. We expect our machine to greatly exceed the capabilities of its competition in this area.