Excalibur
Data Aquisition Paddle

Probably the greatest change in elite sport over the last 10 years has been the emergence of Athlete Measurement Technologies – collecting hard data about an athlete's technique and performance and using it as the primary tool for evaluation and improvement.

It gives the coach a way of identifying and isolating points of improvement, and it gives the athlete a clear path to better performance. It doesn't replace the need for a good coach, but it helps set achievable goals and allows progress to be measured and effort to be focussed.

To assist paddlers and coaches, ***Merlin*** has developed the **Excalibur Data Aquisition Paddle.**

This article we hope will be the first of a series, as we probe the wonderful sport of Dragon Boating.

The Excalibur Paddle is a standard ***Merlin CD2*** with a strain sensor built into the shaft laminate, which captures the load applied to the blade. The more advanced ***E2*** also has a 3 axis positional sensor on the main board, which captures the position of the paddle in 3D space.

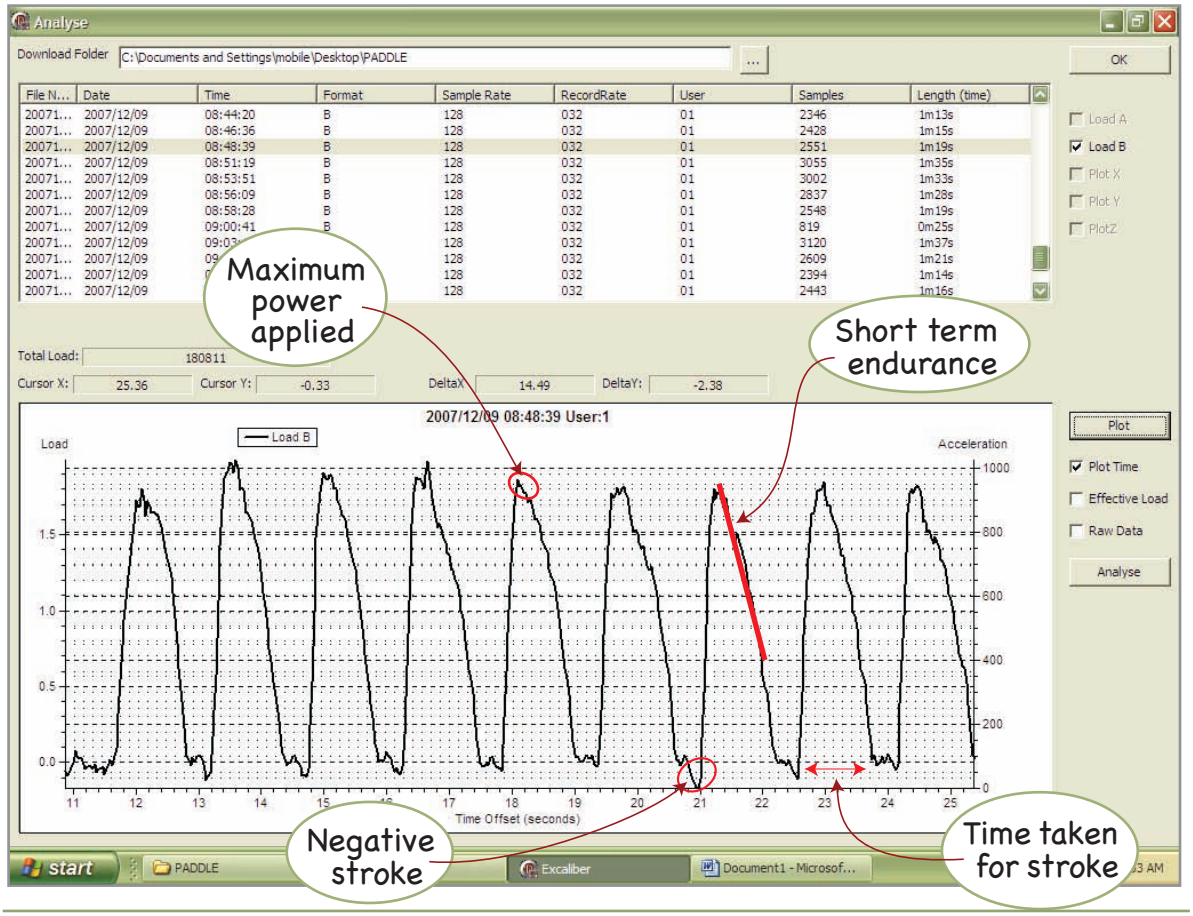
The paddle is only about 90 grams heavier than a standard ***CD2*** and the performance is very similar.

Merlin recently conducted user trials with a Sydney Club, in which 24 paddlers were tested on both sides of the boat.

While the group tested was a group of similarly experienced paddlers, considerable variations were observed in almost every aspect of the power curve.

Paddlers were asked to paddle a stationary boat for 1 minute; the paddle can capture up to 2 hours of data in 4 separate memories.

figure 1 **Force curve for a female A boat paddler**



The Excalibur Paddle measures every stroke, and displays the results as a force curve. This measures the power applied to the paddle over time.

Figure 1 shows a data set for a female A boat paddler.

Points to note are:

- The top of the curve is the maximum power applied and is very dependant on the strength of the paddler.
- The width of the curve is the time the paddle is in the water.
- If you measure the area under the curve you have the amount of work or the energy that is being given by the paddler to moving the boat forward.
- The slope of the top of the curve shows the ability of the paddler to apply power through the entire stroke.
- The change in the size and shape of the curves over the sample shows the fitness of the paddler and their ability to keep both power and timing over the average race.
- The zero load measure is not at the bottom of the curve, and that it is possible to have a negative reading, this is usually caused by not withdrawing the paddle from the water before starting the return stroke.
- The ragged curves are often indicative of side to side movement of the paddle (poor Y axis control)

In *figure 2*, you can see the endurance slope for the test sample. The closer the curve is to horizontal, the more endurance the paddler has. This test was only 60 seconds, so the change is quite small. Over a long race, you might expect to see the curve actually turn into a wave, where the paddler peaks and troughs over time.

In *figure 3* you can see the detail that is able to be derived by enlarging the curve; the force curve is very similar to a cardiogram, there is a lot to be learned from detailed analysis of the small variations in the curve.

figure 2 **Endurance slope for a moderately fit paddler**

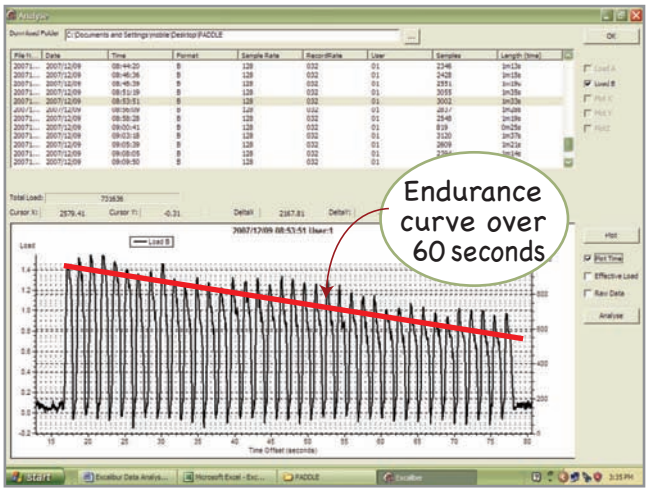


figure 3 **Magnifying the curve**

Research is also being done to observe the macro effects of measuring the same paddler in different locations in the boat, and the way the performance of an individual paddler is affected by the need to maintain a specific timing.

Geoff Taken, head Coach of the Northern Beaches Dragon Boat Club in Sydney, has found the data sets invaluable. He also video-taped the testing session, which has helped to determine some of the more curious features of the data.

Geoff said, *"This is a fabulous tool for taking the guess work out of the selection process, and it gave the team a lot of confidence that the process was fair and impartial. They are also very keen to see the charts of their results".*

Merlin will be using the Excalibur Paddle extensively inhouse to design a new range of paddles, with the aim of making paddling easier and more effective.

MERLIN
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