New on the Scene - The Big Blades

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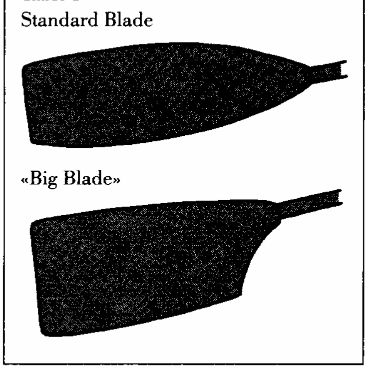
A new design of oar blades has been seen around the world this spring. They are called the "big blades" and were introduced by Concept II of the United States (table 1). The idea for these blades has been around for a long time but no one has been able to perfect the design and necessary adjustments. The following text is a summary of investigations done by the Dreissigacker brothers in the fall of 1991.

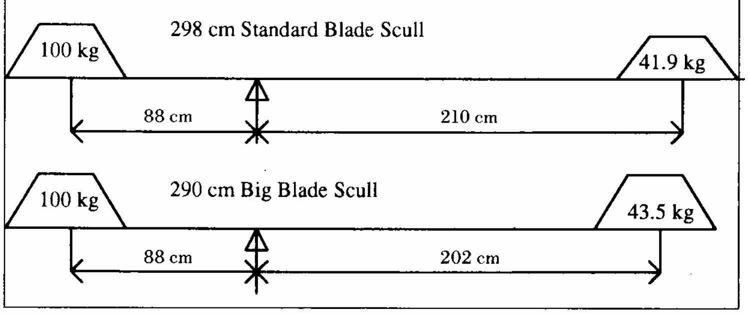
Table I



Theory

A. Suppose the outboard lever of an oar or scull is shortened and the spread stays the same. We all know from experience that this will result in a lighter load at the handle (table 2). Now, suppose the blade size is increased until the original load is again felt at the handle. Because of the shorter lever arm, the same force and velocity at the handle will now generate a greater force and slower velocity at the blade. This greater force at the blade will propel the boat faster. The slower velocity means that the blade slips less through the water. In other words, more work is done on the boat and less work is done on the water - therefore, in theory, a more efficient oar.

Table 2



B. There are limits, however, to how far this approach can be taken before negative factors will outweigh the positive. Some of these negative or limiting factors might be:

1. Blade width will become too much to handle. The blade must be designed to minimise handling problems.
2. The blade might backwater at the inboard edge. This can be reduced by shortening blade length.
3. There might be wind resistance when the blade is squared on the recovery. This is partially compensated for by a reduced outboard length.
4. There might be extra weight with a larger blade. This is partially compensated for by a reduced outboard length.

C. There are other oar variables that were specifically not changed so that there would not be too many things changed at once. The following areas are definitely worthy of study but are not addressed here:

1. *Overall load* - Only oars of equal perceived load were compared in all tests.
2. *Spread and angles at the catch and release* - Spread and inboard were the same in all tests.
3. *Blade curvatures and angle of attack* - There is a lot that can be done here. However, our initial tests did not show any improvement.

Implementation

A. After some initial trials with quickly constructed prototypes, we settled on a general blade shape that would hopefully:

1. Maximise width without impairing handling.
2. Shorten the blade somewhat without losing too much blade area.
3. Maximise blade area within the length and width constraints.

B. Then we followed this pattern of experimentation:

1. Guess at a larger blade size and shorter outboard.
2. Test row and change either blade size or outboard until load feels the same as with standard oar (without changing spread or inboard).
3. Do timed pieces alternating between new prototypes and standard oars.
4. If prototype does not show significant increase in speed, go back to step 1 and try a slightly smaller blade and slightly longer outboard.
5. If prototype shows significant increase in speed (approximately equal to predicted speed increase), then make more prototypes and send oars around for further testing.

C. This process produced the following sizes for sweeps and sculls:

1. *Width:*	*Big Blade*	*Standard Blade*
sculls:	21.5cm	17cm
sweeps:	25.5cm	20cm

2. *Overall Length:*	*Big Blade*	*Standard Blade*
sculls:	290-292 cm	298cm
sweeps:	376cm	383.5cm

Sweeps: approx. 20% bigger
Sculls: approx. 15% bigger

Field Testing

A. The inherent problem in field testing is the difficulty of isolating the variable being tested. The following are six factors that can affect test results, along with some proposed procedural remedies:

1. *Competition* - a) only do timed pieces with one boat at a time; or b) do pieces with a number of boats but have one boat not change oars at all. Compare all times to the unchanged boat as well as comparing the same boat piece to piece.
2. *Weather and Water Conditions* - test on a calm day in still water.
3. *Fatigue* - at least four pieces should be done at an outing, switching oars at each piece.
4. *Control of power due to submaximal effort* - make sure pieces are short enough to allow 100% effort.
5. *Familiarity with equipment* - a) avoid racing starts; b) alternate the oar used on the first test piece each day; c) repeat test after two weeks of using only new oars in practice.
6. *Other rigging factors* (including load, pitch, oar weight, etc.) - make sure all rigging factors are equal.

Examples of early results of testing the big blade

A. Concept II results: CII testing in pair without coxswain. Big Blade tested with 12'7", 12'6". A total of twelve 500 meter pieces at 32 strokes per minute were done over three days. Results: Big Blade was an average of 2.4% faster (measured with a speed meter).

B. Best results: Lightweight sculler Peter Haining (GB) tested Big Blades with 298 cm sculls 12 x 250 m at 32 strokes per minute switching oars every three pieces, running starts. Results: Average time per 250 meters with Big Blades - 52 seconds. Average time per 250 meters with 298 cm standard - 56 seconds. Big Blade was 7% faster.

C. Worst results: Sculler Brian Sweenor rowed 2 x 1000m with Big Blades followed by 2 x 1000m with standard blades against 4+ at 32-33 strokes per minute. By time, the Big Blade was 3% slower; by margin, the Big Blade was 1.25% slower.

D. The only comparative non-CII sweep results: Dartmouth College (USA) did 4 x 5 minute pieces with two fours switching oars every piece. Big Blades always won. Princeton did 2 x (long steady-state pieces, 700m, 500m) with two fours switching between sets. Big Blade always won.