

Rigging Survey 2006

Observations and Comparisons

A reminder about the Survey

- Anthropometric measurements
 - Height discounted
- Full survey and semi survey
 - A number of boats in each event except for the 8's
- Adaptive boats
 - Slightly different measurements
- Comparison with 1999.

FISA Rigging Survey 2006

Equipment identification; Blade Types



Equipment identification: examples of types of rigger

Equipment identification: examples of types of rigger



Traditional 4 stay aluminium rigger



Fillippi 2 stay carbon rigger



Available on the FISA website

- The full rigging data base for Olympic and non Olympic boats
- An adaptive data base for A and TA boats
- A written explanation about the survey and where the measurements were taken
- A picture explanation
- A summary of the 2006 survey
- The 1999 survey for comparison

What we might expect

- There will be trends relating the size of athlete and rig.
- There may be links in rigging characteristics and the boat speed
- There may be trends within a nation as to how they rig
- We can pick out measurements to show if these links exist

M1X 8/9	Range	Average	Correlation to athlete height	Correlation to boat speed
Feet Position (Heels)	33.5 *-43.0**	39 cm	some	none
Span	159-160.2	159.8		
Oar Overall length	287.5 – 290.5 ***	289	none	none
Blade length	43.9-46	44.5	none	none
overlap	23.8 -19.3	21.5	none	none
Gearing	2.472-2.517	2.48	2.517 smallest person	none
swivel height	16-21.5 cm	18.5/ 18.0	none	none

* Shortest person in top 9 scullers *** shortest person & 1 of tallest had these
** one of the tallest.

Why pick these measurements?

Feet Position (Heels)	Would expect feet to be nearer the stern for taller athletes, faster boats
Span	The span can be used to achieve different arc
Oar Overall length	This will not increase the angle but will increase the length of time the blade is in contact with the water
Blade length	Blade size will also give a feeling “grip” on the water
overlap	Overlap can be used to limit or increase the arc
Gearing	How heavy does this feel and how much flexibility to change rate. Smaller people in same event may be harder geared.
swivel height	High swivels effect angle of blade in the water. Allows a longer stroke

W1X 7/12	Range	Average	Correlation to athlete height	Correlation to boat speed
Feet Position (Heels)	32-41.5	37	some	none
Span	157.4 - 162.2	160	none	none
Oar Overall length	285.5- 290	288	none	none
Blade length	42.2- 46.4	44.5	none	none
overlap	17.8-21.7	20.2 *	none	none
Gearing	2.44-2.499	2.47**	none	none
swivel height	14.9-20.8	17.5 /16.0	none	none

* Smallest overlap one of the tallest

**smallest have small span and blades so not excessive gearing

LM1X 7/13	Range	Average	Correlation to athlete height	Correlation to boat speed
Feet Position (Heels)	31.5-46.0	37	some	none
Span	158.6-163.5	159.5	none	none
Oar Overall length	286.5-289	288	none	none
Blade length	42.8-47.7	46	none	none
overlap	18.5-21.7	20.5	none	none
Gearing	2.404-2.495	2.450	none	none
swivel height	12.7-18.00	16.5/14.7	none	none

LW1X 5/8	Range	Average	Correlation to athlete height	Correlation to boat speed
Feet Position (Heels)	30.0-36.5	33.0	some	none
Span	158.6-160	159.2	none	none
Oar Overall length	286-288.5	287	none	none
Blade length	42-46.2	44.0	none	none
overlap	20.5-23.4	22	none	none
Gearing	2.43-2.47	2.45	none	none
swivel height	14.6-16.1	15.5/14.5	none	none

All 1X averages	M1X	W1X	LM1X	LW1X
Feet Position (Heels)	39 cm	37	37	33.0
Span	159.8	160	159.5	159.2
Oar Overall length	289	288	288	287
Blade length	44.5	44.5	46	44.0
overlap	21.5	20.2	20.5	22
Gearing	2.48	2.47	2.450	2.45
swivel height	18.5/ 18.0	17.5 /16.0	16.5/14.7	15.5/14.5

M2X 8/11 W2X 7/10	Range M2X	Average M2X	Range W2X	Average W2X
Feet Position (Heels)	31.5-44.0	36.5	30.5-37.5	34.5
Span	157-161.2	159	158.9-161	159.8
Oar Overall length	289.2-291	290	286-290	288
Blade length	43.5-45.7	44.5	42.5-45.5	44.0
overlap	18.8-25.0	21.0	19.5-23.0	20.0
Gearing	2.478-2.541	2.514	2.426-2.503	2.48
swivel height	16.5-20.5	19.0/17.8	15.2-19.9	18.5/17.0

LM2X 10/12 LW2X 5/8	Range LM2X	Average LM2X	Range LW2X	Average LW2X
Feet Position (Heels)	31.5-39.0	35.0	28.0-36.0	32.0
Span	156.9-158.5	158.2	157.0-160.5	159.0
Oar Overall length	287.0-290.0	289.0	285.1-288.5	288.0
Blade length	43.5-45.9	44.0	42.2-46.0	44.0
overlap	18.8-23.7	22.0	18.1-22.6	20.0
Gearing	2.48-2.539	24.9	2.456-2.516	2.502
swivel height	15.1-19.4	17.0/16.5	14.6-17.5	17.0/16.0

All 2X averages	M2X	W2X	LM2X	LW2X
Feet Position (Heels)	36.5	34.5	35.0	32.0
Span	159.0	159.8	158.2	159.0
Oar Overall length	290.0	288.0	289.0	288.0
Blade length	44.5	44.0	44.0	44.0
overlap	21.0	20.0	22.0	20.0
Gearing	2.514	2.48	24.9	2.502
swivel height	19.0/17.8	18.5/17.0	17.0/16.5	17.0/16.0

Span

The larger your catch angle, the smaller the blade tip speed you need for the same boat speed.

For a boat doing a 2:00 min/500m split (4m/s) the speeds needed are:

30 deg	3.46 m/s
45 deg	2.83 m/s
60 deg	2.00 m/s
70 deg	1.36 m/s

A large catch angle is a 'necessary evil' so you want to get as much from the trampoline effect and correct technique as you can.

Kleshnev and Baker 2007

Overall Blade length /gearing

A detailed analysis on rigging from the 2000 and 2004 Olympic Games by Valery Kleshnev showed that in nearly all cases the gold medallist had the ability to have higher boat speeds at the start and end of the race but had rated lower than the silver and bronze medallists.

Kleshnev 2005

Average angles

Group	Average Catch Angle	Average Finish Angle	Average total angle
Men scull	-66.5	43.8	110.4
L men scull	-64.5	42.6	107.1
Men Sweep	-56.8	34.3	91.2
L Men Sweep	-54.3	33.6	87.9
Women Scull	-62.2	43.0	105.2
L Women Scull	-61.3	42.8	104.2
Women Sweep	-53.5	33.4	86.9

A comparison of spreads

Every 2 cm narrower spread (with the same inboard) adds 0.5 degrees to the catch angle.

Changing the inboard as well accordingly (maintaining a constant overlap) adds 0.8 degrees for each 2cm of spread

Actual range pairs 84.5 – 88.5 average is 85 - 86.5

Observations

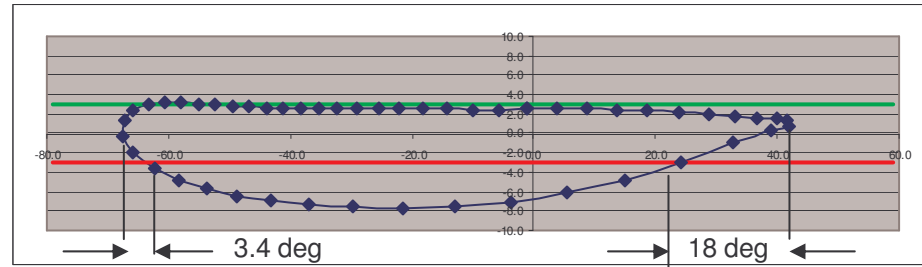
- National Trends do not appear to exist so coaches have the ability to rig as they see fit.
- Biggest variations from crews at the front of event
 - Greek LW2x overall blade length 285.1 and 288
 - Den LM2x Span of 158.2 and 156.9

Trends for further investigation

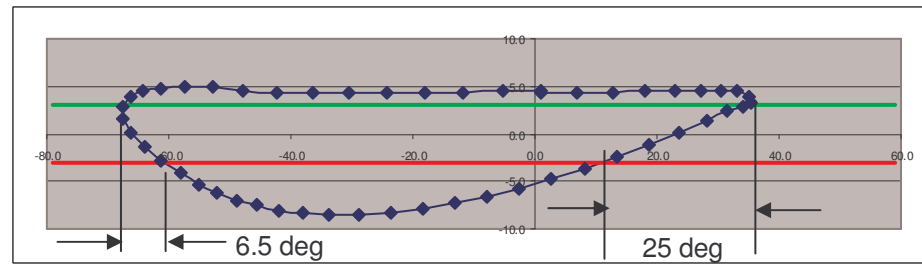
- An aspect of rig allows a bigger angle in faster boats
- Span/ feet position/overlap/overall blade length?

Example – Rower A

GB squad rower A at rate 18



GB squad rower A at rate 40



Questions

- Are the comparisons so small as to make a difference?
- If a difference 2cm in spread only gives 0.8 degrees then is the main error with the rower?
- How much do the athletes adjust to feel comfortable in a boat?

Other sources of information

- Valery Kleshnev biomechanics newsletter
- Tim Baker www.precisionsport.co.uk