

2010

The application of canting keel concept in racing windsurfing fins: does it lead to superior performance?

Rutkowski, L.

Rutkowski, L. (2010) 'The application of canting keel concept in racing windsurfing fins: does it lead to superior performance?', *The Plymouth Student Scientist*, p. 207-233.

<http://hdl.handle.net/10026.1/13904>

The Plymouth Student Scientist

University of Plymouth

All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Please cite only the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.

Appendix 1 – Signed last page of the ethical approval form.

Faculty of Science

15. ETHICAL PROTOCOL & DECLARATION

To the best of our knowledge and belief, this research conforms to the ethical principles laid down by the University of Plymouth and by any professional body specified in section 14 above.

This research conforms to the University's Ethical Principles for Research Involving Human Participants with regard to openness and honesty, protection from harm, right to withdraw, debriefing, confidentiality, and informed consent

Sign below where appropriate:

STAFF / RESEARCH POSTGRADUATES

	Signature	Date
Principal Investigator:	_____	_____
Other researchers:	_____	_____
	_____	_____
	_____	_____

Staff and Research Postgraduates should send the completed and signed copy of this form to Christine Brown, Secretary to the Science Human Research Ethics Committee, A106 Portland Square.

UG / TAUGHT POSTGRADUATES

	Signature	Date
Student:	<i>Leszek Rytkowski</i> <u>_____</u>	<u>13.03.08</u>
Supervisor / Advisor:	<u>_____</u>	<u>13-03-08</u>
	_____	_____
	_____	_____

Undergraduate and Taught Postgraduate students should pass on the completed and signed copy of this form to their School Representative on the Science Human Ethics Committee.

	Signature	Date
School Representative on Science Faculty Human Ethics Committee	<u>_____</u>	<u>13/03/08</u>

Appendix 2 – Research information sheets for survey participants.

RESEARCH INFORMATION SHEET

Name of Principal Investigator: **Leszek Rutkowski**

Title of Research: **“The application of a canting-keel concept in racing windsurfing fins. Does it lead to superior performance?”**

Aim of research:

To gather a set of data providing evidence to whether the new fin application leads to superior performance.

Procedure:

The planned experiment aims at gathering 10 to 15 opinions of international-level windsurfers on a provided new-concept racing fin. The chosen competitors will be given 2 fins – first of a standard design, and a copy of the same parameters with a new fin-board mounting system introduced. The subjects will be asked to compare the provided samples during their training session (safety measures provided by clubs and coaches). They will be then asked to fill a questionnaire asking about their general opinions on the performance and control of the new-concept fin as well as precise parameters such as upwind or downwind speeds and angles. During testing the subjects will be given a GPS device providing additional quantitative data to the experiment.

Risks:

The only risks come from the activity of windsurfing itself. Neither the designed experiment nor the equipment used bring in any new hazards. Overall the risk was classified as 'low'.

Right to withdraw:

Every participant of the project has the right to withdraw at any chosen time. He/she does not have to justify his/her decision. The participant may also ask for all his personal data to be destroyed.

If you are dissatisfied with the way the research is conducted, please contact the principal investigator in the first instance: +447895459095 or +4860040765. If you feel the problem has not been resolved please contact the secretary to the Faculty of Science Human Ethics Committee: Ms Christine Brown +441752232762.

Appendix 3 – Research participants consent forms
CONSENT TO PARTICIPATE IN RESEARCH PROJECT

Name of Principal Investigator: **Leszek Rutkowski**

Title of Research: **“The application of a canting-keel concept in racing windsurfing fins. Does it lead to superior performance?”**

Purpose of work:

This project is an investigation into the possibility of applying a modified technology of the fin-board joint in Formula Windsurfing class equipment. The aim of the project is to gather a set of data providing evidence to whether the new application leads to superior performance. The planned experiment aims at asking international-level windsurfing competitors to compare 2 provided fins, one of which has the new joint system introduced. The subjects' opinions and feelings will be compared with numeric data gathered using GPS devices.

The objectives of this research have been explained to me.
I understand that I am free to withdraw from the research at any stage, and ask for my data to be destroyed if I wish.
I understand that my anonymity is guaranteed.
I understand that the Principal Investigator of this work will have attempted, as far as possible, to avoid any risks, and that safety and health risks will have been separately assessed by appropriate authorities.
I declare that my answers to the questionnaire provided after the experiment will be honest, based on my own judgments and that I will not try to influence the investigation's results in any way.
I declare that I will not discuss any technical details of the equipment tested with anyone who is not involved in the project.
I agree to take part in the experiment taking full responsibility for my actions. I state that I have valid insurance covering windsurfing-related situations and that I should not lay any claims on the project's leader in case of any accident or equipment damage.
Under these circumstances, I agree to participate in the research.

Name:

Signature:

Date:

Appendix 4 – Questionnaire

“The application of a canting-keel concept in racing windsurfing fins. Does it lead to superior performance?”

Date:

Name:

Body mass:

Wind conditions:

Wave conditions:

Is there a significant overall difference between the tested fins?	YES	NO
	<input type="checkbox"/>	<input type="checkbox"/>

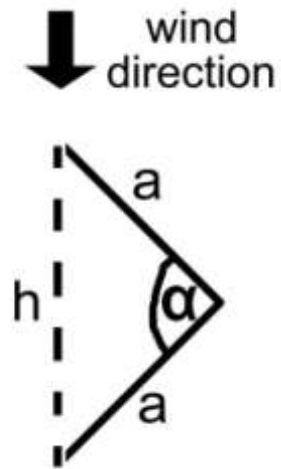
	Standard fin		No difference	Canting fin	
	1	2		3	4
Angle on upwind courses?	1	2	3	4	5
Speed on upwind courses?	1	2	3	4	5
Angle on downwind courses?	1	2	3	4	5
Speed on downwind courses?	1	2	3	4	5
Overall control?	1	2	3	4	5

Which of the tested fins would you choose for these particular conditions?	Standard	Canting
	<input type="checkbox"/>	<input type="checkbox"/>

Do you have any thoughts about the fin’s performance that aren’t included above?

Signature:

Appendix 5 – Effective upwind / downwind performance calculation.



$$h = 2 \cdot a \cdot \sin\left(\frac{\alpha}{2}\right)$$

Appendix 6 – Measurement error calculation equations

equation 1:

if $C = k \cdot A$

then $\Delta C = k \cdot \Delta A$

equation 2:

if $C = A \cdot B$

or $C = \frac{A}{B}$

then $\Delta C = C \cdot \sqrt{\left(\frac{\Delta A}{A}\right)^2 + \left(\frac{\Delta B}{B}\right)^2}$

