

# ***SpeedCoach***<sup>®</sup>***XL***

## ***SpeedCoach***<sup>®</sup> ***Gold***

### Interface Installation Plus Hints & Guides

# NK

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Thank you for purchasing your SpeedCoach system. It should provide you with years of trouble-free service but we are always here to help if a problem arises. To order parts or accessories or obtain technical support, please call 02 6553 2473. You may also e-mail questions to our support representatives at info@nk.com.au or visit NK online at www.nk.com.au

# ***SPEEDCOACH Communicator***

## ***Install Instructions***

**Suits both GOLD & XL models**

**\*\*\*UNINSTALL ALL PREVIOUS VERSIONS OF NK COMMUNICATOR \*\*\***

Thank you for purchasing the SpeedCoach Interface and Communicator Software. This system will upload the stored data from your SpeedCoach System to a computer for long-term storage, in-depth analysis or detailed charting. The Interface will also download workouts directly to the Control Unit & clear the memory.

Files on the CD:

- the Communicator install program
- USB adapter driver files
- a video on how to set up the XL
- SAMPLE DATA FILES
- owner & installation manual

**Ensure that you select which model SpeedCoach you have placed in the interface cradle in the “select model” check box.**

**After installation, check for FREE updates at [www.nkrowing.com.au](http://www.nkrowing.com.au) under “manuals & downloads”**

What's in the Box (USB port version):

- NK Interface Cradle - SpeedCoach control unit snaps into the cradle for optical communication.
- NK Software CD-ROM - contains Communicator software and the USB Adapter drivers.
- A USB Cable - plugs into the interface and your computer.

What You'll Need:

- a PC with an available USB port.
- Windows 3.1 or higher
- a SpeedCoach Gold or XL System



### **Install the USB adapter software.**

- BEFORE plugging the adapter cable into your computer, load the enclosed CD (if it auto loads, select "cancel") Browse to the CD-ROM in My Computer and open the "USB ADAPTER DRIVERS" folder. Browse to the appropriate folder for the operating system that you are using (usually winXP ).
- Double-click "setup.exe". Follow the on-screen prompts to install the drivers for the USB adapter cable.
- When the "Install Shield Wizard Complete" window appears, click "Finish".
- Now, plug the USB connector of the cable into your computer. On Plug and Play compatible versions of Windows, a "Found New Hardware" icon will appear, followed shortly by a message that your new hardware is installed and ready for use. (On older versions of Windows, you may need to complete the "Add New Hardware" process manually. Refer to the documentation for your operating system for more information.)
- Your adapter cable is now installed and ready to use with the Interface. You will need to finish setting up the communication (COM) port after you install the Communicator program.

### **Install the Communicator software.**

- Put the SpeedCoach Communicator disk in your CD drive. It will auto start. Follow the on screen instructions. (If you computer has "auto start disabled", click on the "setup.exe" file).
- The self-extracting software will install automatically on your machine.
- Once installed,click on the "SpeedCoach Communicator"icon on your desktop.
- Setting the COM port.When the Communicator application is launched for the first time, it automatically detects the available COM ports on your system. On the "SpeedCoach" tab, locate the drop-down list labeled "COM Port", and select the appropriate COM port. The Communicator will remember the COM port you select, and use it by default every time.
- Click on the "Help" tab for full instructions on how to use the Communicator software with your interface.
- Note: you need to have the .net Framework files installed on your computer.The installation process will install these on your computer automatically.



**Want to watch the XL set up video for free?  
Then visit the NK web site at:  
[www.nkrowing.com.au](http://www.nkrowing.com.au)**

### **How to Connect the Interface:**

- Plug the end of the serial cable with the pins into the connector on the interface.
- Plug the end other end of the cable into an available USB port.

### **Communicating with the SpeedCoach:**

- The SpeedCoach must be set to the PC Mode before communicating with the PC.
- The com port in the Communicator software must be set to the same port that the USB adapter is set to.
- Ensure that you select which model SpeedCoach you have placed in the interface cradle in the “select model” check box.

### **How to Mount the SpeedCoach:**

- Slide and lock the SpeedCoach Gold into the Interface docking station, the same way that it mounts in the boat.
- Put the SpeedCoach in communicate mode.

### **INSTALLATION FAULT FINDING:**

Please ensure that you have the latest version of the software. FREE updates and support is available from:

[http://www.nkrowing.com.au/cms.cfm?Section=row\\_support](http://www.nkrowing.com.au/cms.cfm?Section=row_support)

- Make sure that you aren't running any ActiveSync software, such as for a PDA or GPS. If so, the synch software will control the COM ports, which will not allow the software to operate properly. This software typically opens automatically when you turn on your computer. You might find an icon for ActiveSync in the lower right corner of the Windows Tray. If the icon is visible, then the software is running in the background. You can usually right-click the icon and select Exit or Deactivate.
- Make sure that the COM port setting is correct in the Communicator program. You can find the port settings on the Device Manager in the Control Panel. If you are using a USB-serial adapter, the port may be set to a value higher than 4. If you are using the NK supplied adapter, it will show up under “ports (COM & LPT)”. The device will be called “Prolific USB-serial Com Port”, with the port number shown after that.
- We do not have any software to run the Communicator on a Mac, our software is only Windows compatible. You should be able to use the Communicator software on a Mac that is running Parallels, but we have not tested this. Mac Parallels runs Windows XP on Mac computers. So if a program is compatible with Windows XP it should run on Parallels (the Communicator software is compatible with XP)

## I'm having trouble downloading data from my SPEEDCOACH. What do I do?

### Is the USB driver properly installed? How to check:

- Right click on My Computer icon on your Desktop, go to Manage.
- This will bring up the 'Computer Management' window
- Under the System Tools, click on Device Manager
- This will bring up a list of your Computers hardware
- Click on the '+' sign next to Ports

If 'Prolific USB-to-Serial Comm Port (COM #)' is listed under the Ports tab, then the USB driver is installed. If not, install the USB driver disc. The driver is also available on our website.

### What COM port is the Interface using? How to check:

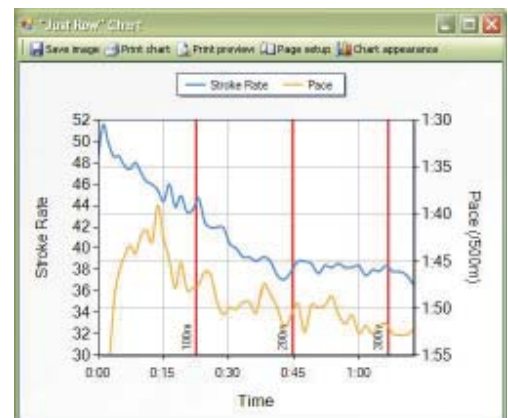
Follow the same path that you used to check if the USB driver is installed. If the driver is installed the COM port that the interface is using will be listed in the Device Manager. Next to the 'Prolific USB-to-Serial Comm Port' will be the COM port that the Interface is using. Must be set between 1 to 4.

On the main window of the Communicator software, there is a drop down list of available COM ports. Click on the COM port that is listed in the Device Manager.

- Check all of the cables (USB -> Serial)
- Make sure the unit is fitted snug into the cradle and check to see if there is anything obstructing the two clear ports on the rear of the unit near the battery door.
- Is the unit on?
- Make sure that the SpeedCoach is in the Communications mode.
- Make sure that you select which model SpeedCoach you have placed in the interface cradle in the "select model" check box.
- Are you running anything else on USB at the same time (GPS or cellphone?)

**Ensure that you select which model SpeedCoach you have placed in the interface cradle in the "select model" check box.**

Check the Knowledge Centre on our web site for updated help.  
For any enquiries, please contact us on  
02 6258 9380 or email: [info@nk.com.au](mailto:info@nk.com.au)



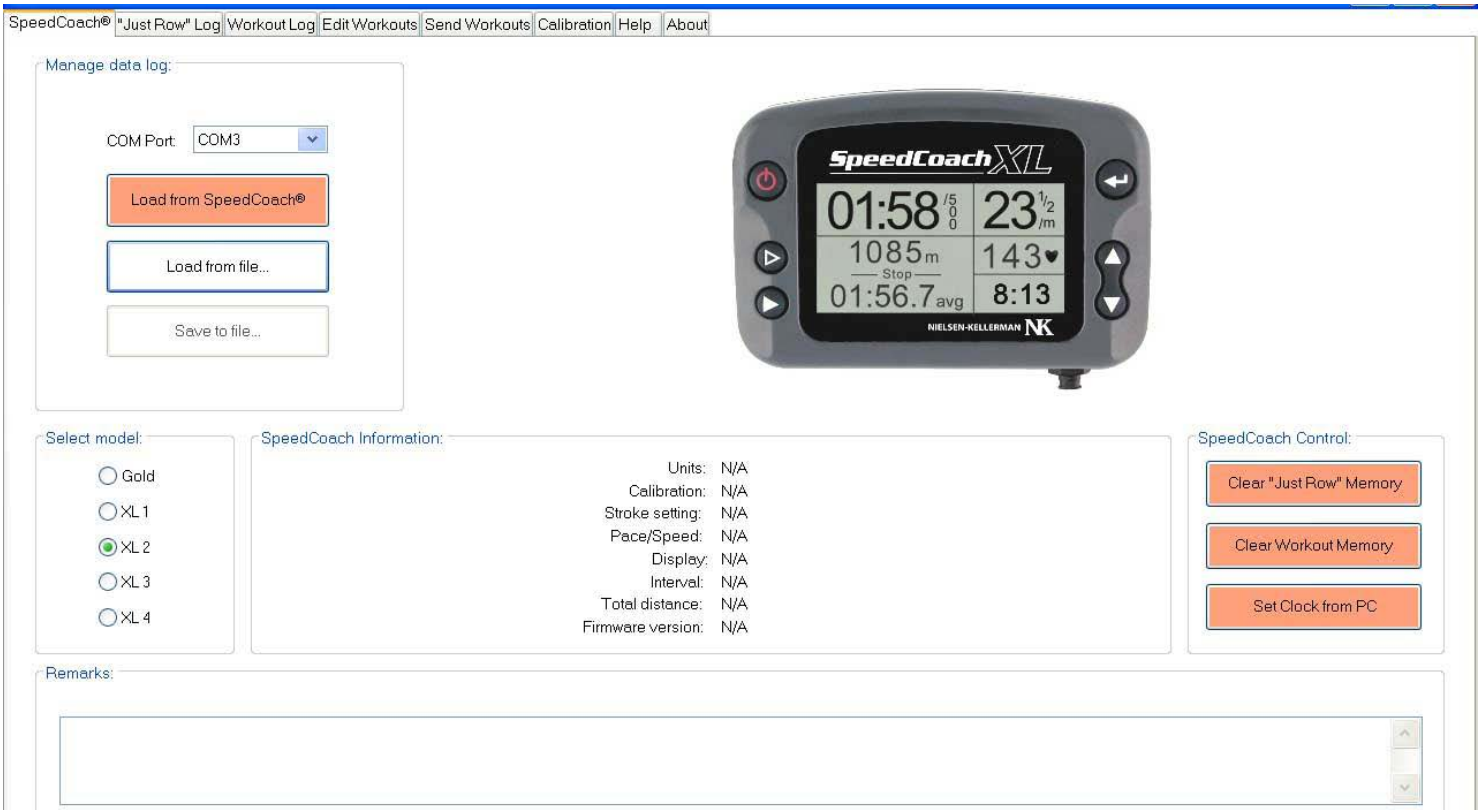
# SpeedCoach Communicator Interface

By Frank Biller

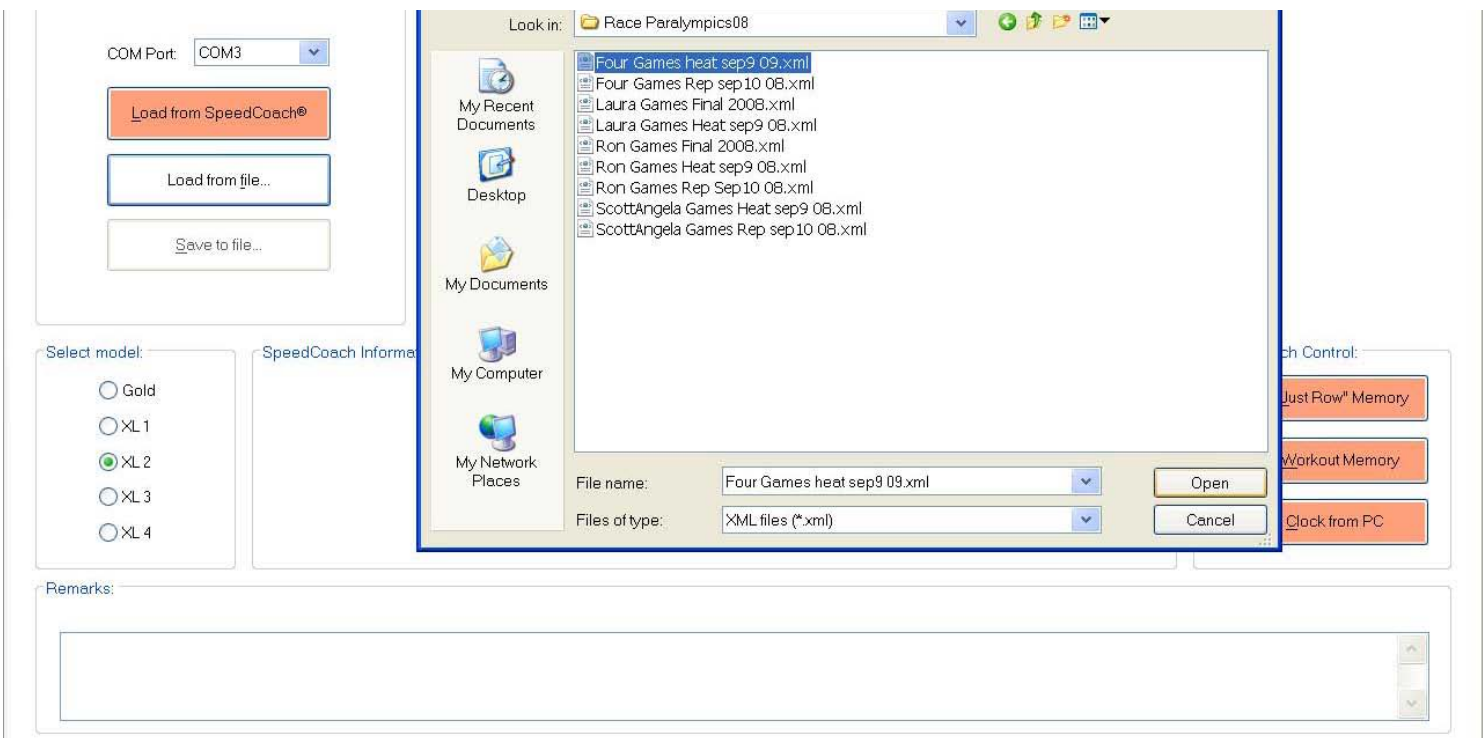
As important it is to see what's happening while you are rowing, the "after-action-review" can be very revealing. Knowing what happened can often make the difference between winning and losing. Visualizing the speed of a race or piece with a chart can be worth a thousand words, and sometimes a medal.

Here are some quick instructions on how you can utilize your SpeedCoach data with the interface (optional) and the Communicator Software.

1 - Open Software and either press "load from SpeedCoach" to download from the unit or open an existing file.



2 - In this example pick the file you want to open. I highly recommend to be very organized, either by date or event, as well as boat. Create directories!



3 - Check the settings of your SpeedCoach, also you can add and edit notes anytime. It's recommended! It

The screenshot shows the SpeedCoach Communicator software interface. At the top, there's a menu bar with options like "SpeedCoach®", "Just Row" Log, "Workout Log", "Edit Workouts", "Send Workouts", "Calibration", "Help", and "About". Below the menu, there's a "Manage data log:" section with a "COM Port:" dropdown set to "COM3" and three buttons: "Load from SpeedCoach®", "Load from file...", and "Save to file...". To the right is an image of the SpeedCoach XL device displaying a screen with various metrics: 01:58.6/0.0, 23.1/2m, 1085m, 143, 01:56.7 avg, and 8:13. Below the image, there's a "Select model:" section with radio buttons for Gold, XL1, XL2 (selected), XL3, and XL4. Next to it is "SpeedCoach Information:" with settings like Units: meters, Calibration: 1.000, Stroke setting: 2 (seat switch), Pace/Speed: Pace, Display: Strokes, Interval: 1 stroke, Total distance: 224.686 km, and Firmware version: 2111. On the right, "SpeedCoach Control:" has buttons for "Clear 'Just Row' Memory", "Clear Workout Memory", and "Set Clock from PC". At the bottom, there's a "Remarks:" section with text about the Paralympics Beijing 2008 and a "Loaded: 9/9/2008 9:01 AM" timestamp.

4 - Identify the piece you are looking for. The SpeedCoach XL will make a date/time stamp every time you reset the timer, so it's easy to find. Also, on the right there will be a brief summary with time and distance

The screenshot shows the SpeedCoach Communicator software interface with the "Recorded pieces:" section selected. It displays a list of recorded pieces with a date/time stamp for each. The selected piece is "Friday, June 15, 2007 2:48 AM". To the right, "Piece Data" shows: Records: 123, Time: 4:10.2, and Distance: 1015.1 m. Below this is a detailed table of recorded pieces.

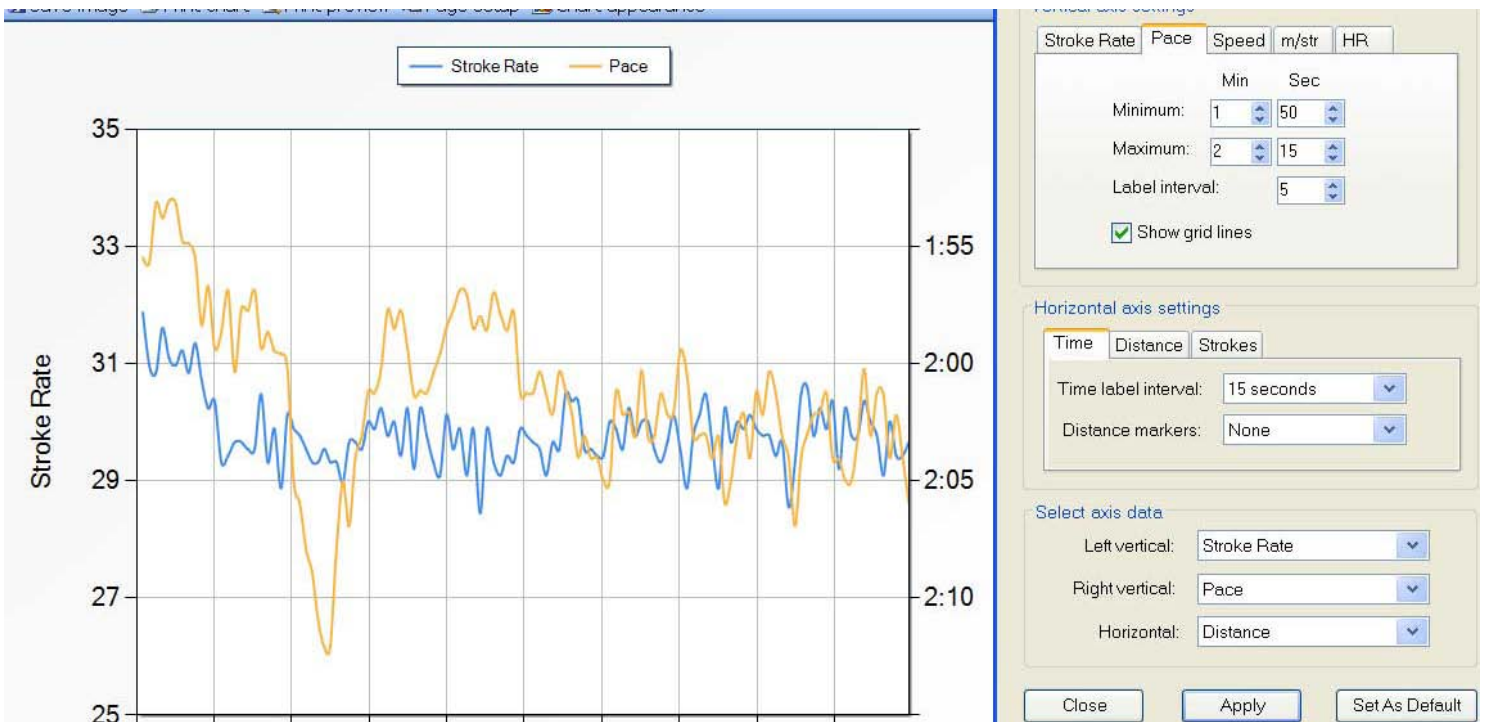
Interval	Type	Dist (m)	Time	Stroke	Re
1	S	9	0:01.9	1	
2	S	17	0:03.9	2	
3	S	26	0:05.9	3	
4	S	35	0:07.8	4	
5	S	43	0:09.9	5	
6	S	52	0:11.9	6	
7	S	61	0:14.0	7	
8	S	69	0:16.0	8	
9	S	78	0:18.0	9	
10	S	87	0:20.1	10	

5 - Identify and highlight data points you want to analyze in detail (see summary on the bottom of average value for highlighted data) or simply hit "Chart Data"

108	S	897	3:37.3	108
109	S	906	3:39.4	109
110	S	914	3:41.3	110
111	S	922	3:43.4	111
112	S	930	3:45.4	112
113	S	938	3:47.3	113
114	S	946	3:49.3	114
115	S	955	3:51.4	115
116	S	963	3:53.4	116
117	S	971	3:55.4	117
118	S	979	3:57.5	118
119	S	988	3:59.5	119
120	S	996	4:01.5	120
121	S	1,004	4:03.6	121
122	S	1,013	4:06.0	122
123	S	1,022	4:08.7	123

Intervals: 120 | Dist: 995.7 m | Time: 4:01.5 | Strokes: 120 | Rate: 29.8 | HR: 0 | Speed: 4.12 m/s | Pace: 2:01.3

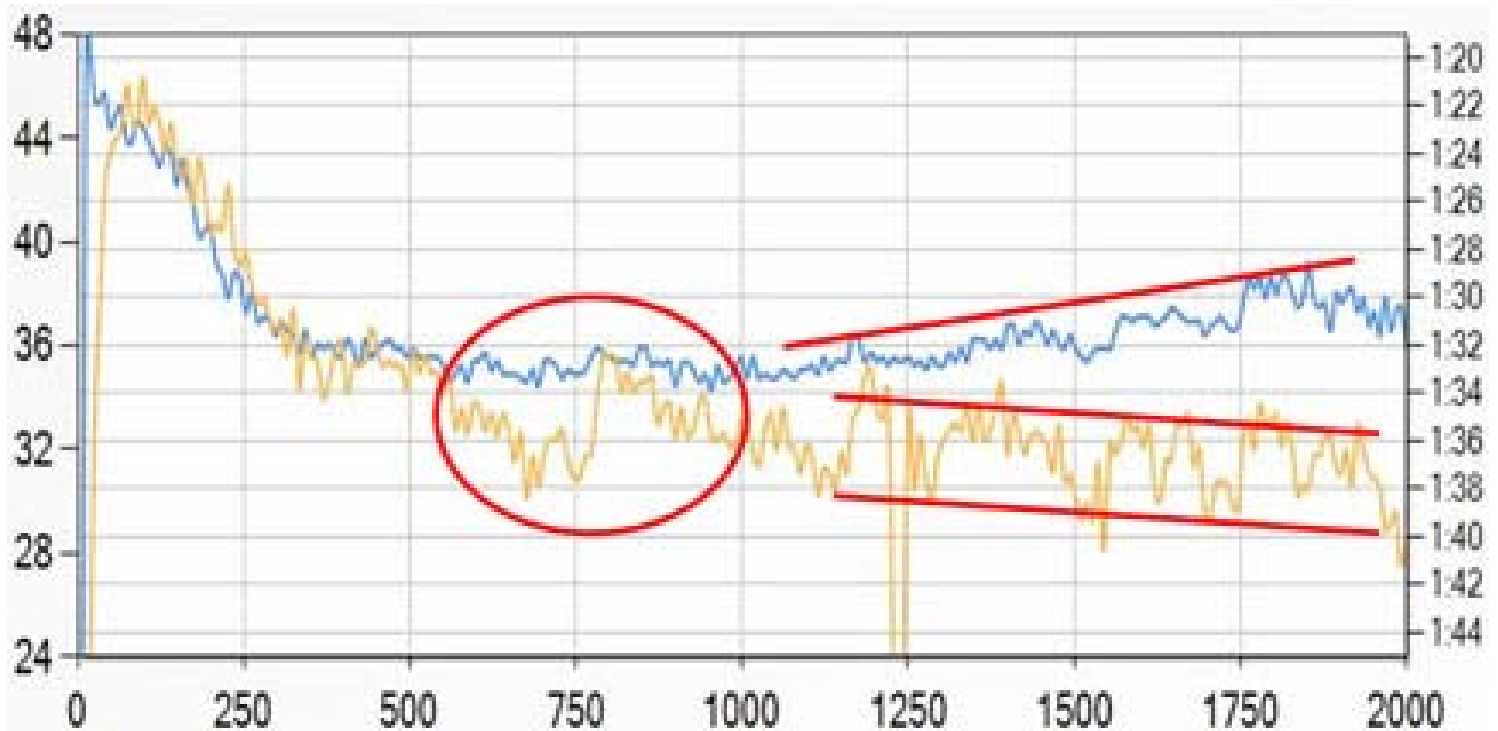
6 - Get your data charted instantly, then use the Chart appearance function to set your preferred settings, such as values, range of data etc. You can also chose a set-up as "Set as Default" for other, similar data sets. With a little practice you will have a perfect chart done in less than one minute!





## NK Speed Coach Interface and Analytics Software

Besides the stroke for stroke speed feedback, the Speed Coach has an additional very important capacity: the ability to record races and practices for later review. With the easy-to-use Speed Coach Communicator software, pieces and races can be analyzed within minutes — and a picture often tells more than a thousand words. In the example below, the race plan was for a big move at the 750 meter mark. In unintended anticipation of the move, the crew took off the power a bit and the speed dropped while the stroke rate remained the same. Right after the 750, the move came as planned.



BLUE = stroke rate; YELLOW = speed

Two things happened that were costly:

1. The other crew moved back before the move, which made the move appear ineffective, hence bad for morale;
2. Based on the maxim that “to double the speed on the water it requires 8x more energy” such speed variations are a flat out waste of energy. Consequently, the race became a struggle from that point on and was lost. However, the clear visual picture showed the crew the problem – and they performed better the next day!

## ISS – Intra Stroke Speed

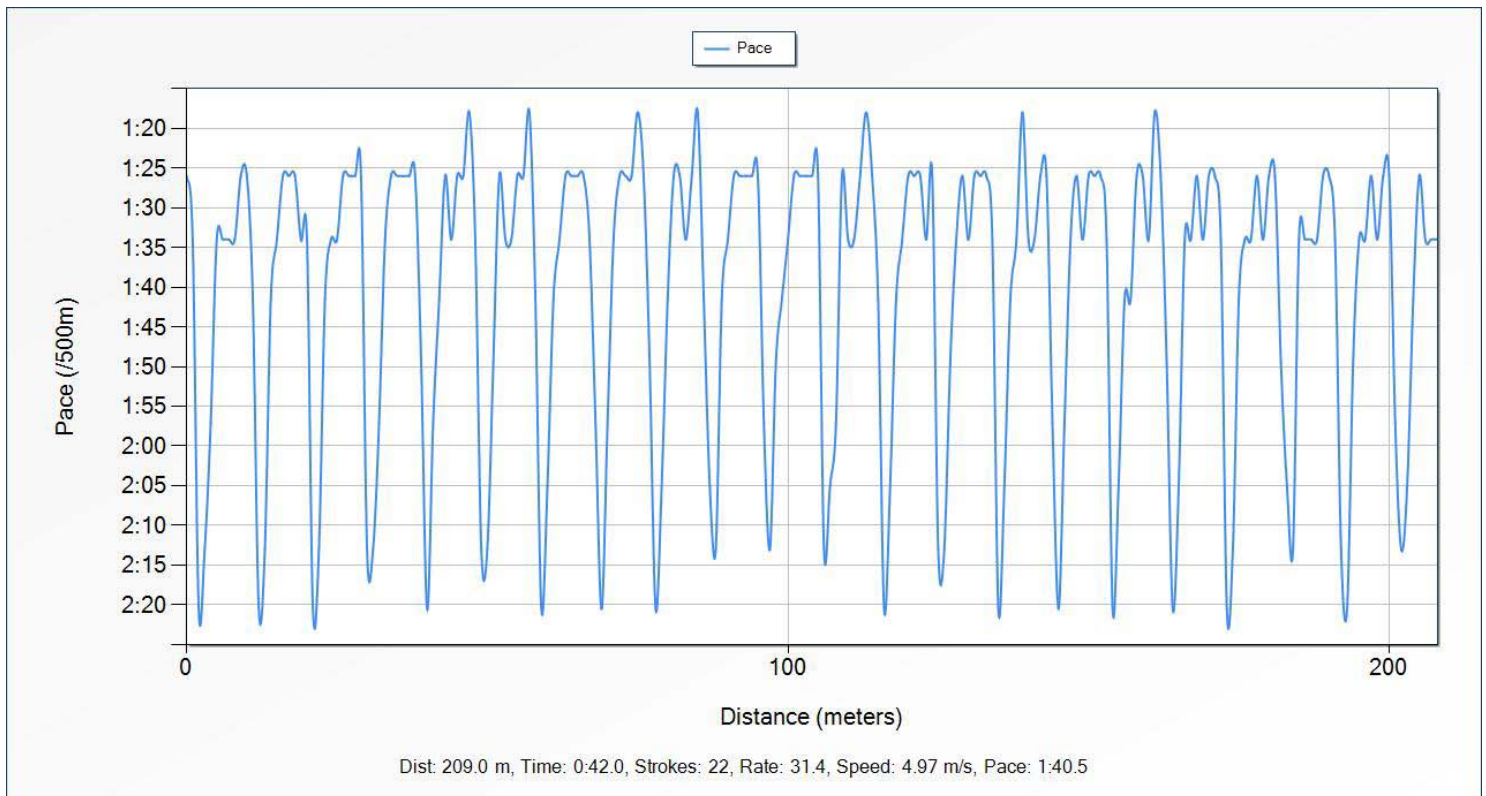
By Frank Biller & David Ireland

Coaches and athletes often ask us whether we could make a product that could do force measurement, speed curves through the stroke, angles of oars, display speed realtime, bells and whistles on the SpeedCoach and so on. The main reasons for why the SpeedCoach is designed the way it is now, displaying average data per stroke, are utility and simplicity, along with meaningful data – displayed immediately.

We all know that the speed through the stroke varies greatly, expressed in 500 meter split, it's easily one minute in small boats! That's the difference between top speed at the release and lowest speed before catch. NK customer David Ireland started running some experiments by setting the memory interval to "Distance" and "1" on his SpeedCoach Gold. We did some more experiments with the SpeedCoach XL, and thanks to the larger memory for "Just Row" of 1,500 memory points, we were able to review about 1,500 meters of rowing in depth.

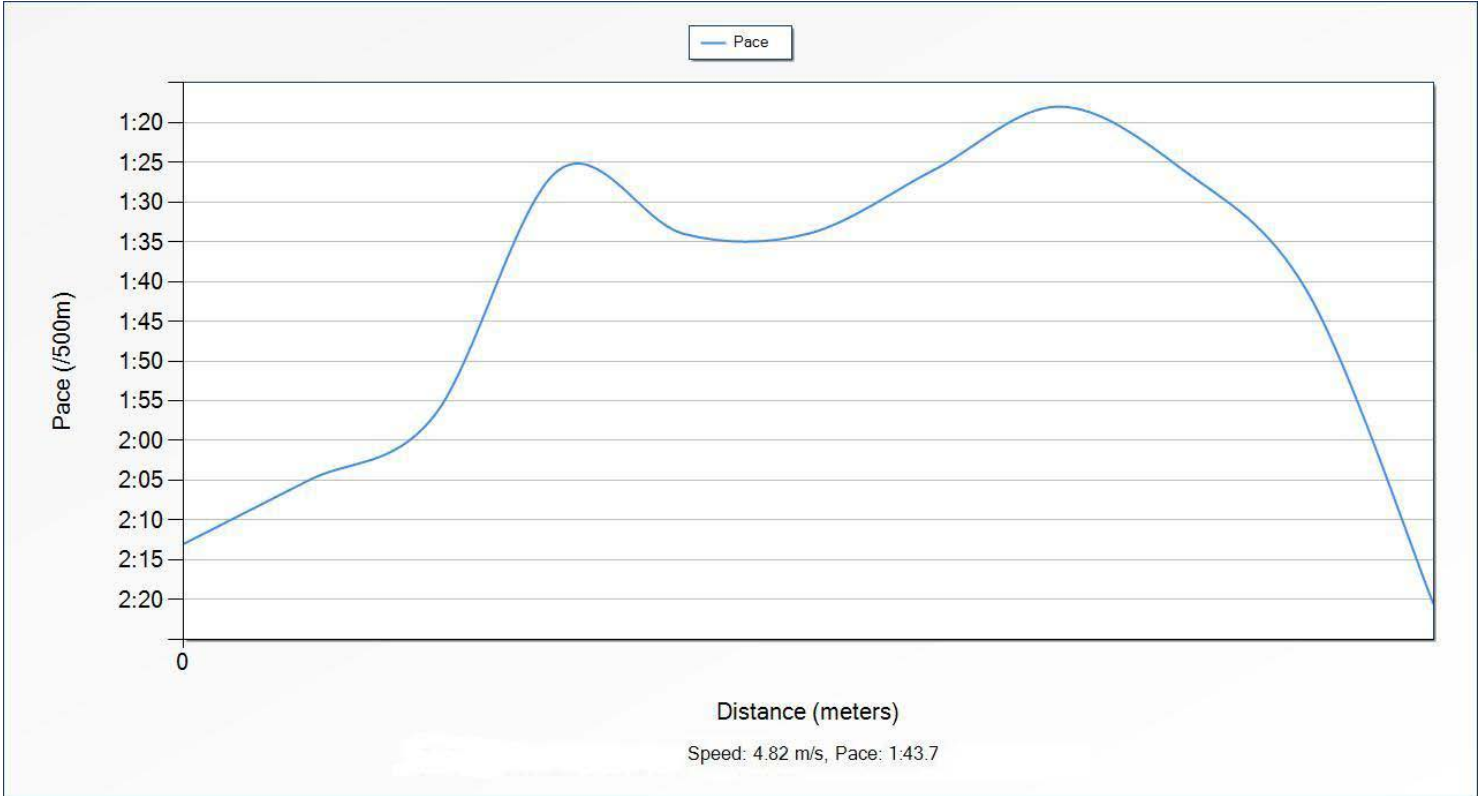
This article illustrates simple and effective ways to get useful data from your SpeedCoach. The tests were performed over the course of several workouts, and they immediately showed us very interesting results. These tests were run by rowers, not scientists, so don't be intimidated to try this yourself.

With the memory interval set to Distance, 1 meter, the SpeedCoach will record the average speed for each meter rowed. We recorded 200 meters at pace in a 2x and it looked like this:

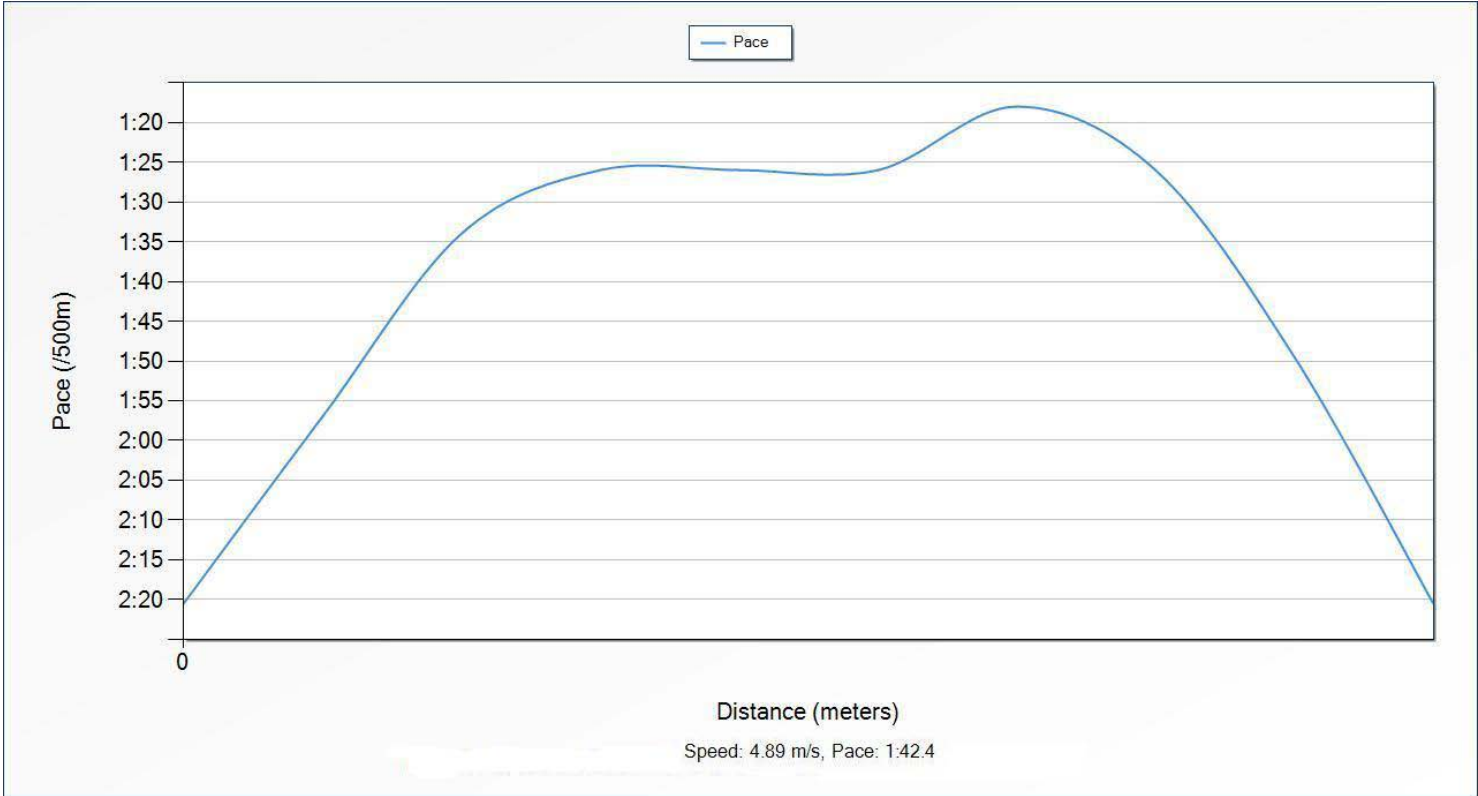


This chart, by the way, was done via the USB interface and the free Communicator software. Once data is downloaded, it takes less than a minute to make this chart. It is interesting to look at this sequence of 22 strokes. Clearly some strokes have higher peaks and some are more even.

We can also easily look at some single strokes in detail to see if we gain information from it:



This is a single stroke with two peaks (camel back), probably slightly late catch and a bit of delay with connection, then a strong drive with long finish. Let's compare that stroke to the faster catch, easier-feeling stroke below:



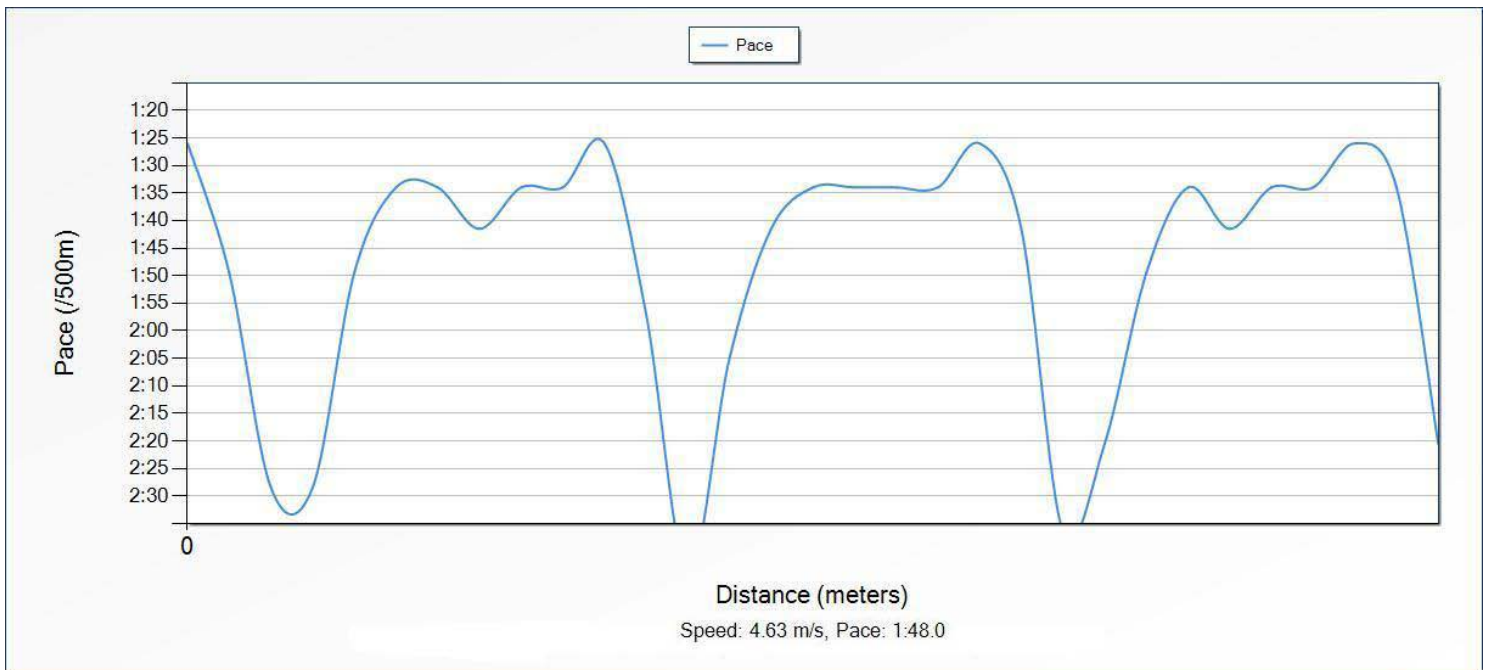
Nice smooth line with continuous acceleration for the boat until the release. Also, look at the speed difference between the two, the smoother stroke is about 1.5% faster!

This raises the question of how would that look for different equipment, rigging, line-ups etc. Let's see. In the following two charts we have a M1x at stroke rate XX, once using set-up A, and once using set-up B, again detail analysis of a stroke sequence. For both we have the same boat, same rower, same stroke rate and effort, but changed oars, blade design and rigging specifications:

### Setup A



### Setup B



We can see the “camel backs” in set-up A, while B is slightly smoother and maintained a higher overall speed, being over 5% faster than A.

Keep in mind that we used “distance” for the memory criteria. It would be optimal to use time, for example every 0.1 seconds. The reason being that the faster the boat goes, the faster one meter passes, hence this will make the graph look more volatile. But, you get the message and basic picture.

## How To Do It

### Equipment Needed:

- SpeedCoach GOLD or any XL
- Boat equipped with wiring and impeller
- SpeedCoach interface
- Communicator software installed on your pc (free)

### SpeedCoach Set-up:

- Set SpeedCoach to display distance in meters (standard)
- Set "just row" memory to "distance" and value to "1", which means it will record every single meter rowed.

### Procedure:

- Know what you want to look for? Rigging, line-up, playing around?
- How many meters or strokes at what pace/stroke rate, make sure your crew or your teammates are on the same page.
- Keep notes on what did in which piece.
- Do not exceed memory. For the Gold this means max of about 500 meters of rowing, for the XL 1,500 meters.
- Download data on PC – chart with Communicator Software. Adjust parameters for Y-axis until you got entire chart in. Keep in mind, up to one minute difference is possible!

## SpeedCoach® Gold/XL Interface

To get the best out of your SpeedCoach Gold and XL, an optional SpeedCoach Interface with a USB adapter is available. This interface will upload the stored data from your SpeedCoach System to a computer for long-term storage, in-depth analysis or detailed charting. The Interface will also download workouts directly to the Control Unit & clear the memory.

Commencing from V3.0 the SpeedCoach Gold and SpeedCoach XL use the same versions of the Communicator Software.

### What's in the Box (USB port version):

- NK Interface Cradle - SpeedCoach control unit snaps into the cradle for optical communication.
- NK Software CD-ROM - contains Communicator software and necessary system files for PC (both Gold & XL) plus the drivers for the USB adapter (for Winows 98, 2000, XP & Vista).
- A USB Cable - plugs into the interface and your computer.



### What You'll Need:

- a PC with an available USB port.
- Windows 3.1 or higher
- a SpeedCoach Gold or XL System



**Want to watch the XL set up video for free?  
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## Tech Talk: How Olympians Will Use the Impeller

It is an undeniable fact that an impeller on the hull of a shell will cause us to think of additional drag and therefore loss of speed. Anyone who watched the M4- final in Athens in 2004 knows what a close race at this level looks like, when Great Britain edged Canada by 0.08 seconds. So, race with the impeller or not? We have a lot of insight on the different approaches and have identified three main strategies. (Obviously we cannot reveal which country or athlete is doing what.)

**Training and preparation only:** This group uses the impeller and Speed Coach in training to maximize boat speed and for selections. They might race with it in pre-season races but at some point take the impeller off the boat and the focus off the speed.

**Half and half:** Probably the largest group of Speed Coach users will travel to championships with the impeller on the boat and will use it to adapt a race strategy to the course. They pay attention to their speed at certain points in the race. They might use it through the heats and even semifinals. Data analysis after each stage often helps for significant improvements in the racing strategy. After rehearsals they take it off and race with stroke rate only for the finals. The fear of losing a tight race remains intimidating to many.

**Always with:** A select few (and mostly very successful) teams always race with the impeller on the hull. To them the correct and most efficient pacing during a race is worth more than the relatively insignificant amount of drag the impeller produces. Of course the other way to look at losing a close race is “we would not have been that close if it was not for the pacing.” There are world champion teams that built their winning strategy on precise pacing in the final.

In the end there is no right or wrong – the decision is part of a whole picture and plan. Based on observations at last year’s championships in Munich however, there are hardly any competitors at this level who don’t work with speed measurement at some point in the preparation



## Tech Talk: Heart Rate or Split?

It seems that there is quite some discussion these days on what is the best way to train. Should you consider heart rate or only power output (e.g. splits or watts on the erg, as well as boat speed). Well, since there are many ways to skin a cat, we would rather just provide you with the proper tools to do either. Or better — watch both!

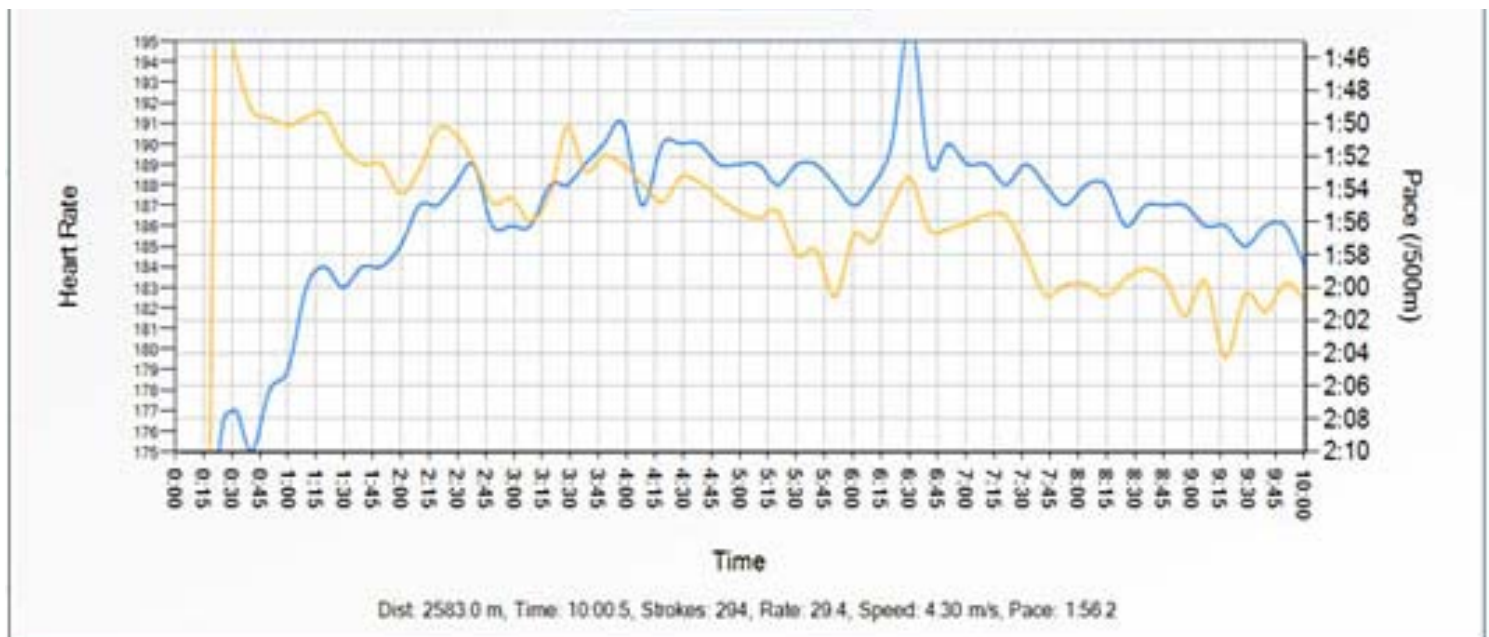
Ever since Polar brought out the first ever wireless heart rate monitor in 1982, the “Sport Tester,” the way athletes trained changed dramatically. It became possible to monitor heart rate in real-time without interrupting training. For rowing, the introduction of the self-calibrating Concept2 ergometer monitor (that was NK engineering, by the way) improved training further as athletes now had instant feedback on their power output.

As technology further improved and became more affordable, force measurement was built into the pedals of elite cyclists. The “Watt Output” started to become an important measurement for performance monitoring and has, in some areas, become standard.

In rowing today, it appears that the majority of athletes are still training according to heart rate zones. Technology has also improved here and the monitoring today is relatively simple and cost-effective, compared to sophisticated force measurement in a boat. However, anecdotally, there seem to be more and more training programs that are based on “output” — for example percentages of maximum speed. The NK Speed Coach can easily be used for that, however it requires a bit of practical experience to properly account for environmental influences such as wind and water temperature. In addition, technique has a significantly higher influence on the “speed output” in rowing compared to “wattage” in cycling.

This is why we believe the Speed Coach XL2 is such a great performance measurement tool. It allows you to monitor output (speed/stroke rate) and heart rate on one simple screen and it's easy to use. In addition, all this information can be stored and recalled or downloaded to your PC for analysis later.

Analyzing your heart rate is interesting, but more important are the tendencies compared to work performed (or power), be it on the water or erg. Besides indicating your overall fitness development (faster at same effort, same speed with less effort), it also serves as an early warning sign for illness or overtraining — conditions if not treated right can be devastating to a training cycle. Together with many other influences including heat stress (see the Kestrel Corner for that!), it will show you that something is up and requires your attention.



Above: Heart rate in the second half is relatively inconsistent just like the rowing, which shows technical deficiencies as well. It is more efficient to row at a steady speed. With the NK Communicator Software, it is also easy to see that the average heart rate was 185. In the training diary for example the following can now be recorded: Time: 10 min, Avg SR: 29.4, Avg Pace: 1:56.2, Avg HR: 185  
Conditions: slightly choppy with cornering head wind

## Does Size Matter?

By Frank Biller

Although some might expect a discussion on body size and that rowers are tall, perhaps even going down the slippery slope of ergo scores versus on-water performances, sorry, I am sticking strictly to product discussions here.

### Size of XL

With NK's launch of the SpeedCoach XL series, a number of customer have raised concerns over the size of the unit, as well as its weight. We all know that lighter is probably better in rowing, especially when it comes to "dead weight", weight that does nothing to improve boat speed. In many discussions with concerned customers over the past two years I successfully explained how perception and effect don't always match. Benefits are often greater than perceived cost, and of course, coming away from what we are used to takes some time as well. Granted, an XL3 weighs about 7 ounces (200 grams), double the weight of a SpeedCoach Gold. To put it in perspective, that 3.5 ounces difference is less than the weight of that pre-row cup of coffee. Although it's doubtful this will ever make the difference in a race, there is another aspect: benefits for training!

A junior/high school rower generally trains about 500 hours per year, an elite athlete about double that, around 1,000 hours per year (source: Volker Nolte, "Rowing Faster"). If we assume that about 3/4 of the time is spent in the boat and of which about 1 1/2 hours is pure racing time, we can conclude that only about 0.2% to 0.3% of an athlete's time in the boat is spent racing. This means that rowers spend over 99% of their time working hard to get faster and improving technically. Wouldn't you want the best possible tool to spend this time most effectively? Heck, if you do this 99% of the time right, you can race with a kitchen clock around my head and still be faster! Of course, we were delighted to see several boats racing with an XL at the Olympics even, probably not even 0.001% of their time in the boat in an Olympic year. And if you think it throws you off-balance, the silver medal Canadian pair had no problems mounting their unit on the starboard gunwale...

### Impeller Size

Recently a smaller impeller was brought to our attention, that according to the manufacturer has a much better drag effect than our impeller. Always wanting to improve, we are of course interested. However, having seen it I was rather disappointed, smaller isn't always better. Just like with coxswain minimum weights, there are limits to everything. We had similar experiences in our Kestrel Pocket Weather Meter side of Nielsen-Kellerman, where smaller impellers entered the market to measure wind speed. However, the significantly reduced size of the impeller fins (that makes it spin) are also prone to increased slippage and therefore more likely to produce inconsistent and inaccurate readings. In addition to the fin size other aspects are to be considered: Is there a high quality ball bearing inside the spinning part to allow consistent spinning? How is the finish of the impeller, is the entire surface perfectly smooth? Is the entire fin streamlined and optimized for laminar flow?

The smaller impeller manufacturer claims that "the HC micro impeller dramatically reduces drag, susceptibility to damage and weed contamination" but has not provided any flow tank data to support this. NK has a flow tank & can supply data to support our claims (see the page opposite).

Another issue is where the impeller is placed. Since we absolutely want to avoid putting anything into the laminar flow of the boat near the bow, we are, in respect to drag, much better off in the turbulent layer, where the drag effect is less. However, in order to be able to measure the flow, the spinning part cannot be too close the hull either, as the turbulent flow changes drastically with the speed changes a rowing shell produces during a single stroke. And of course, the change of the profile of the boundary layer with increasing boat speed also needs to be accounted for, since it's by no means a linear relationship.

Since we spend so much time training (see above) and accurate feedback is important, I cannot stress enough how a visual perception, for example size, can fool us when it comes to performance, accuracy and benefit.

So the answer to the question, "does size matter?" I would say "not always".



## Why we recommend placing the impeller between five to six metres from the bow.

**Laminar vs. Turbulent Flow:** On a rowing shell, two different kinds of flow are apparent. The smooth laminar flow at the bow (depending on the boat and speed, this can extend up to three metres from bow ball) and turbulent flow, all the little vortices along the hull that ultimately create the lovely sound of a fast moving boat. The laminar flow is very important to boat speed – laminar flow creates significantly less resistance. Therefore, everything has to be done to maintain laminar flow. Even the smallest disruption on the hull will create turbulent flow right away and create an undesired effect on the boat. Hence it's particularly important to keep the bow clean at all times and free of dents, scratches and tape. For this reason we avoid placing the impeller in the laminar flow.



**Accessibility:** A wireless pick-up of impeller measurement is a must to avoid drilling holes through the hull. Hence, a sensor needs to be placed as closely as possible to the spinning impeller. In most rowing shells, there is an easy placement for both around five to six metres from the bow (typically around the two-seat). Since the sensor should be somewhat protected from outside influence, we recommend to place it under the foot stretcher. Under no circumstances should it ever be necessary to drill holes into bulkheads or have wires dangling on bow decks.

**Boat pitch:** The vertical movement of the boat during each stroke needs to be accounted for, too. The impeller needs to be ideally placed where the flow conditions are consistent. Through the pitch, boundary layer thickness changes close to the bow. With our impeller position we have more stability and therefore more accuracy.

**Thickness of Turbulent Layer:** The layer of turbulent flow increases along the hull and also with increasing speed. Additional minor inaccuracies and differences in hull designs affect the boundary layer. To maintain consistent conditions that allow precise calibration, placement of the impeller between five and six metres from the bow works best for most accurate distance and speed measurement.

**Effect on steering:** Five to six metres from the bow, the impeller is relatively close to the turning point of a rowing shell, even an eight. If mounted in the bow, however, an impeller will act as a fin in front of the turning point and could have an adverse effect on steering of a shell.

**How much drag does the impeller create, and will it slow me down?** The hydrodynamic design of the NK impeller mount actually creates a fraction of the drag of a standard skeg. Laboratory tests were performed on the hull mount impeller to determine the drag effects on a rowing shell. For single sculls, the drag from the hull mount impeller is approximately 0.1% of the TOTAL boat drag, and proportionately smaller for larger boats. A larger size impeller does not equal more drag since it is placed in the turbulent flow, however, even the smallest object in or near the laminar flow will have a significant negative effect on boat speed (with no gains).



## Using the SpeedCoach with Novice Rowers

Guest Columnist Bethia Woolf, Novice Coach, Ohio State University

I find the speed coach very useful to use with novice rowers. Let's face it, rowing can be a bit boring for athletes who come from other sports like basketball and volleyball. Steady state rowing once they get past the initial learning stage is extremely repetitive. Using a speed coach gives athletes another level of stats, which can be useful in those longer steady state practices. It provides the coxswains with another tool for feedback. Additionally it allows them to see whether their calls are effective and whether the rowers are responding to what they or the coach is saying. Knowing that a particular technical call made you go a split or two faster benefits everyone. The SpeedCoach also helps to keep the rowers honest in terms of their intensity, in the same way that the numbers on the erg screen do. It therefore helps to build consistency and gives them a more objective level of feedback, than just "how it feels". That objective feedback 'the numbers don't lie' can change the dynamic between the rowers and the coach or coxswain. Telling a crew that the speed has dropped is different when the data is available.

The main benefit I find though is preparing for the racing season. The SpeedCoach definitely helps us to learn about pacing and to break the race down into its 500m quarters. At some point every rower needs to understand that it isn't about winning the race at the first 500m mark, but about the most efficient way to be ahead at the finish line. The SpeedCoach can help you to develop and stick to your race plan as well as analyzing how effective it is or how well you executed it.

The most important use of the SpeedCoach as a learning tool for me is teaching starts and sprints. Crews working on a racing start can really get overly focused on the stroke rating and you often hear the rowers (and coaches) asking at the end of a practice start 'what rate did you hit?'. This obviously misses the point. What we are looking for in a start is to get off the line as fast as possible and then to smoothly transition to our race speed and cadence out in front of the pack. This is where a SpeedCoach is invaluable, compared to a rate meter. With the SpeedCoach you can focus on boat speed and not just stroke rating, so the question can be 'how fast did you go on that one?' (or with an XL, you don't even need to ask!) This allows you to demonstrate that stroke rating does not necessarily equate to speed and that an inefficient, overly high stroke rating may just be wheel spinning. It really helps you to explain cadence to novices and that strokes per minute is not speed. This also applies to sprinting - the SpeedCoach allows you to focus on increasing boat speed rather than just taking the stroke rating up. In the same way, the SpeedCoach allows you to analyze the effectiveness of moves or pushes. With the SpeedCoach you can see whether the move was actually effective in terms of increased speed.

The SpeedCoach is an invaluable tool in the quest for boat speed over stroke rating alone.



## Time Trial: How It's Done Right

By Frank Biller

Time trials in rowing are tricky since the result depends on several significant factors, such as environment (water, wind and weather), athletes (fitness, technique, motivation) as well as quality of execution. Regardless of the purpose of the time trial (selection, testing of equipment or rigging), there are a few rules and a simple procedure to follow for better results:

**Goal:** Comparable results! It is not the absolute value you are after but the best result. In order to be able to compare several time trials, even throughout the seasons, and to draw conclusions, you need comparable results. Therefore you must apply the same procedure every time you do a time trial.

### Here is a good way to go, you need:

SpeedCoach Gold or XL, wiring and impeller for boat  
Communicator Interface to download data to PC  
Kestrel Wind Meter (if possible)

### What the boat needs to know:

Purpose of time trial (selection, equipment testing, performance testing, etc.)  
Procedure (warm-up, Start/Finish land mark, rate cap/effort)  
Set memory recording to "Stroke" and "1" so the SpeedCoach record every stroke

### Procedure:

When the boat starts the time trial you keep even with them with your motorboat. Start measuring "AVERAGE wind speed" at the start.

Hold the Kestrel outside the motorboat in direction of the course and don't change position.

When the boat crosses the finish line you note the displayed value in meters per second.

Download the SpeedCoach data for the piece, e.g. average speed from start to finish. Here is an example:

Dist: 995.4m (real time trial distance was 1,000 meters landbased)

Avg Pace: 1:49.6

Normalized 1,000m (2x 500 meter split 1:49.6) = 3:39.2

Calculate wind speed, assuming the Kestrel showed an average wind speed of 2.8 meters per second at the finish line:

Boat Speed in m/s - Wind Speed in m/s = Net Wind Speed; that gives us:

4.56 m/s (same as 3:39.2) - 2.8 m/s = 1.8 m/s TAIL wind

Note: if the wind measured while going along with the boat is less than the boat speed, we had a tail wind. Therefore, if wind speed measured is higher than boat speed we had a head wind.

Adjust boat speed for wind speed, using for example Valery Kleshnev's wind adjustment formula ([www.biorow.com](http://www.biorow.com)) will give me the following time adjustment for the 1.8 meter per second tail wind:

Avg Tailwind 1.8 m/s ~ 7 sec to add

and therefore: Time Trial Score: 3:39.2 + 7 sec = 3:46.2

You may say that the boat's SpeedCoach time of 3:39.2 already "contains" the tail wind and that if measured at zero wind, the boat would be slower. That is correct, however, it is more accurate in respect to actual wind effect while going along with the boat. Remember we want comparable data, hence we must apply the same procedure each time. Alternatively you could measure wind conditions stationary, but that will be only accurate for the precise location of measurement, not the boat. Also comparing data taken under similar conditions is more accurate, however you will find a high correlation of trends in head and tail winds.

Although this method may not appear perfect, it is much better than just using a stop watch, especially if you have any kind of current or tide. In addition, this time trial can be run by a single coach without helpers on shore or other motorboats.

NK developed the first SpeedCoach more than 10 years ago, and thousands of rowers and coaches have relied on it to help them train more effectively. We're continually making changes and improvements to the SpeedCoach line to make them easier to use, and better performing. Here are some of the common questions we get about the SpeedCoach line of products.

### **How does the SpeedCoach Help Me to train more effectively?**

The SpeedCoach can be such an influential training tool by giving you immediate, quantitative feedback on the way the boat is moving. Did a rigging change help? How about concentrating on quicker catches? If the boat is going faster, then yes, it did. This immediate information is especially valuable for rowers who don't have a coach with them all the time, for coxswains who are making critical race plan decisions, and for coaches who are determining the fastest combinations through seat racing. Strokes of coxed boats can also benefit from the information the SpeedCoach provides - and giving them their own display unit lets them see the stroke rating and boat speed without having to be told by the coxswain. They will know immediately when the stroke rate starts to vary, and they will be able to confirm stroke rate changes on the second stroke.

For maximum benefit, give every rower in the boat their own display unit. NK provides specific wiring for each individual seat in the boat. Multiple wiring harnesses' speed sensors can use the same impeller, allowing every rower to see the same information at the same time. The motivational power of seeing the speed jump when the crew makes a move is tremendous. Elite crews are training with multiple SpeedCoach setups and seeing the benefits of the results.

### **How does the current affect the speed readings?**

The SpeedCoach accurately measures speed and distance through the water so current does not affect your workout distances or times over those distances. By using the distance shown on the SpeedCoach instead of a land-measured distance, you will always be rowing the same length piece regardless of current. This is because the impeller on the boat doesn't 'see' the current in the water. To the impeller, you are always sitting on still water.

If this is a little confusing, imagine sitting in a current without rowing. One minute later, your boat will have traveled some distance down river, even though you haven't rowed a single stroke. The SpeedCoach will read a distance of 0 metres. Conversely, if you row upstream at the exact speed of the current, the SpeedCoach will display this speed and track the distance traveled even though you will appear to be making no forward progress on land.

The benefit of this is that you can compare times for upstream and downstream pieces of equal length measured by the SpeedCoach. For example, if you row a land-measured 2000 metre course both upstream and downstream, this is how far you might have actually rowed through the water and the corresponding time to finish the piece:

	Upstream	Downstream
Actual Distance Rowed (m)	2200	1800
Time (min:sec)	7:30	7:00

You would not be able to compare these times because the pieces on-land measurements were affected by the current, and so were actually different distances.

Next workout, ignore the land course and use the SpeedCoach to measure the 2000 meters rowed. Now look at the distance and time for the piece:

	Upstream	Downstream
Actual Distance Rowed (m)	2000	2000
Time (min:sec)	7:15	7:17

(This crew showed some fatigue on the second piece)

The SpeedCoach eliminates the effect of the current on the time of the piece. Now you can compare pieces from day to day and in any current.

### **How much drag does the impeller create, and will it slow me down?**

The hydrodynamic design of the NK impeller mount actually creates a fraction of the drag of a standard skeg. Laboratory tests were performed on the hull mount impeller to determine the drag effects on a rowing shell. For single sculls, the drag from the hull mount impeller is approximately 0.1% of the TOTAL boat drag, and proportionately smaller for larger boats.




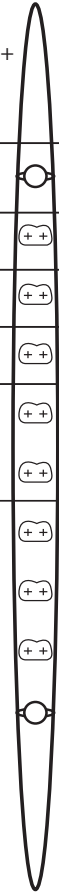
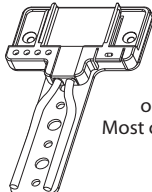
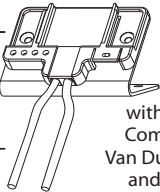
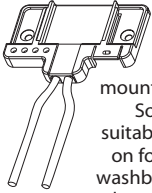
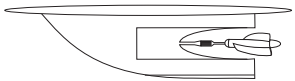





### **What about other performance measurements?**

Force, acceleration, check, drag... these are all pieces of information that coaches ask us about. But it all boils down to one critical measurement- and that's boat speed. The boat with the least amount of check isn't necessarily the boat that crosses the finish line first. That's why NK has focused on developing the best measurement electronics for boat speed - it's what wins races, and we believe if you train with that focus, you will go faster.

# SpeedCoach® Configuration Guide

## Shell Setup Includes:

Mounting Dock with VHB Tape, Seat Sensor, Seat Magnet, Speed Sensor, Hull mount (with Impeller)  
 OPTIONAL: Mounting Bracket #0280 (T) or #0282 (Deck)

	1x	2x 2+ 2-	4x 4+ 4-	8+	Wiring Harness	Typical Bracket	Speed Cable Length	Rate Cable Length	
									
	Bow Cox	Bow Cox	Bow Cox	Bow Cox	3166	0282	3.66m	2.13m	 <p><b>0280 T-Bracket</b> Installs on footstretcher or wall of cockpit. Most commonly used.</p>
1x	Bow	Bow	Bow	Bow	3155	0280	0.91m	1.68m	
	Stroke	2 Seat	2 Seat	2 Seat	3165	0280	2.13m	1.68m	 <p><b>0282 Angle Bracket</b> Installs on deck or wing rigger with dual-lock tape. Commonly used for Van Dusen, Maas Aero and Kayaks. May be helpful for bow cox (can be rotated 90° and mounted on hull interior).</p>
	Stern Cox	3 Seat	3 Seat	3 Seat	3166	0280	3.66m	2.13m	
	Stroke	4 Seat	4 Seat	4 Seat	3168	0280	5.79m	2.13m	
	Stern Cox	5 Seat	5 Seat	5 Seat	3172	0280	10.06m	2.13m	
			6 Seat	6 Seat	NOTE 6 & 7 Seats will have extra length. May coil extra length or order custom harness (extra cost). Sectioned harness also available for #3172 (extra cost)				
			7 Seat	7 Seat					 <p><b>No Bracket</b> Harness dock comes with VHB mounting tape applied. Some boats have a suitable mounting area on footstretcher plate, washbox or cockpit and do not require bracket.</p>
			Stroke	Stroke					
			Stern Cox	Stern Cox					
	 <p><b>0151 HULL MOUNT</b> Includes hull mount, impeller &amp; VHB Tape</p>								
	 <p><b>3000 REPLACEMENT IMPELLER UNIT</b> Screws into existing hull mount</p>								
	 <p><b>KAYAKS</b> Stroke rate from paddle tilt switch</p>				3160	0282	1.83m	1.07m	 <p><b>0152 Two piece Hull Mount</b> Optional removable hull mount Suitable for Kayaks, Dragon Boats &amp; Surf Boats (requires a #3000 impeller).</p>
	 <p><b>CANOES (HIGH-KNEEL OR OC-1)</b> Stroke rate from impeller's speed</p>				3161	0280, 0282 or None	1.07m	no rate sensor	
	 <p><b>KAYAKS</b> No stroke rate, speed only</p>				3161	0280 or None	1.07m	no rate sensor	
	<p><b>DRAGON BOAT</b> Stroke rate from impeller's speed</p>				3166	0282 or None	3.66m	no rate sensor	<p><b>Mounting Hardware</b> All required mounting hardware is shipped WITH the mounting bracket - screws and nuts, bolts with T-Bracket. Dual-Lock tape with Angle-Bracket.</p>
	<p><b>SURF BOAT</b> Stroke rate from impeller's speed</p>				3161	0282 or None	1.07m	no rate sensor	

## INSTALLING THE SPEED SENSOR & IMPELLER

On a rowing shell, the SpeedCoach unit is factory calibrated for correct readings with the impeller installed at 5 to 6 meters from the bow of the boat. This location will typically fall under the footstretcher of a single, or around two seat of a larger boat. Installing the impeller in this location should yield accurate performance even if you don't calibrate your unit. All boats produce a boundary layer of turbulent water from about 2 to 3 metres from the bow to the stern. The first 2 - 3 metres typically fall in the area of the laminar layer. This is where the boat cuts through the water, with hardly any turbulence (depending on size and speed). Anything within the first 4 metres of the boat will have a significantly higher effect on the friction drag of the hull, always keep it clean and avoid any kind of disturbance, even a piece of tape. An impeller in that area will also have a negative effect on the way the boat runs, particularly on steering! If need be, you can put the Impeller at up to 8 metres, but you may need to calibrate. You should avoid placing the impeller farther than 8 metres from the bow because the water will be too turbulent for the impeller to spin consistently, so accuracy might be compromised - even if calibrated.

**With emerging technology and affordability of GPS, coaches and rowers often ask why NK's speed measurements still rely on an impeller. Below is a recent article written by Dr. Volker Nolte, an expert on biomechanics as well as internationally accomplished coach and rower, comparing GPS and Impeller based speed measurements:**

Thanks to the improvements in technology, it is now possible to give rowers invaluable feedback about their performance in the boat. Electronics developed at a pace that was unthinkable a few years ago measures time and distance with minuscule sensors and computer chips. The computer then calculates related quantities like stroke rate and speed, displays it on monitors and still is small and light enough to be used in a racing shell without any measurable influence on the performance of the rower. Therefore, it is understandable that more and more rowers utilise such equipment.

Rowers use electronic feedback equipment to direct their training towards very specific, but different goals. High performance athletes want to control their training intensity to gain the desired fitness improvements in the most effective way and look for feedback during their races. Recreational rowers need information to direct their power output for health reasons. Researchers use training and race data to analyse performances for physiological, biomechanical and strategy studies.

For each of these tasks, it is critically important that the feedback one receives from the equipment is correct. The electronics provide indicators that potentially have very serious and important consequences for the rower. In case of incorrect data feedback, athletes may choose inappropriate intensities that do not lead to improvements, or even put the athletes' health at risk. Obviously, researchers need proper data to interpret their findings correctly.

Therefore, it is very important for any user to know exactly which data the respective equipment provides. In general, two different methods are currently utilised to measure the quantities mentioned above: Impeller and GPS.

Impeller measurement is based on the principle that the water sets it in a motion that corresponds with the speed of the boat that it is attached to. The motion of the impeller is directly dependent from the flow of the water relative to the boat. This means that the movement of the boat relative to the water is measured. Sensors in the boat record the spinning of the impeller to calculate the required data.

Global Position Systems (GPS) measure the position of the receiver as a place on the earth's surface. If the receiver is connected with the boat, GPS is able to track its movement and can calculate various data from that. This means that the movement of the boat relative to the ground is measured. Below, you find a comparison of the two measurement systems.

GENERAL INFORMATION		
System	Impeller	GPS*
Necessary equipment	Monitor, impeller, wires, (magnet on sliding seat possible, but not necessary)	Monitor, receiver
Necessary preparation	Impeller and wire installation, calibration	None
Measurement method	Impeller spins with moving boat relative to water; computer counts turns of impeller; calculates distance traveled relative to water, boat velocity relative to water, stoke rate	Computer receives signals from satellites to determine position on earth every 1-3 sec; calculates distance traveled over ground and boat velocity over ground
Calibration	Through rowing of a known distance, the calibration factor is found and set on monitor	Automatically done by computer
Accuracy	Distance traveled and velocity always relative water: Less than 2% for any measurement with or without current	Distance traveled and velocity always over ground: ~ 1- 15m for position or any distance;  This means that without current the distance or velocity measurement for one single stroke could be off by more than 10%, but accuracy improves dramatically with overall distance and the calculation of average velocity over longer time; Measurements of actually traveled distance and boat velocity on water with current are off depending on the relation of the current speed to average speed of the boat relative to the water
Energy consumption	Low	Relatively high

	Impeller		GPS	
	Without current	With current	Without current	With current
Actual total distance rowed	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2% <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2% <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good for large distances -Accurate by 1-15m <b>Negatives:</b> -Possibly inaccurate for small distances	<b>Positives:</b> -Measurement is over around <b>Negatives:</b> -Extremely inaccurate
Speed per stroke	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2% <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2% <b>Negatives:</b> -Calibration necessary	<b>Positives:</b>  <b>Negatives:</b> -Measurements vary widely from stroke to stroke	<b>Positives:</b>  <b>Negatives:</b> -Extremely inaccurate
Average pace	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2% <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, if properly calibrated -Accurate by 1-2% <b>Negatives:</b> -Calibration necessary	<b>Positives:</b> -Very good, through increased accuracy of traveled distance -Improvement through smoothing programs <b>Negatives:</b>  	<b>Positives:</b>  <b>Negatives:</b> -Extremely inaccurate

**In conclusion:**

Despite its very simple usage, GPS systems have to be operated with care. The information generated by GPS is potentially extremely inaccurate, especially when used on a body of water with current. Used without consideration of this fact, the training feedback could harm an athlete's development or even health.

The impeller system, however, clearly shows advantages when calibrated properly. When not calibrated, the impeller system will still show accurate, corresponding changes in speed.

**About the Author:**

Volker Nolte is men's head rowing coach and assistant professor at the University of Western Ontario, where he teaches coaching and biomechanics and coaches the highly successful men's rowing team. He was the lightweight men's national team coach with Rowing Canada from 1992 to 2000. His national team crews won an Olympic silver medal at the 1996 Atlanta Games, two World Championship titles in 1993 and 2000, and several medals at World Championships in recent years.

Nolte received a PhD in biomechanics from the German Sport University in Cologne, and is an internationally acknowledged expert in biomechanics. With his expertise in the coaching field, he presents frequently at scientific and coaching education conferences worldwide. This year, Volker published his latest book, "Rowing Faster".

\* Information regarding GPS systems relates to commercially available instrumentation at comparable costs of impeller systems

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All pricing is available from our website  
Secure on-line shopping now available**

## NK Rowing Electronics Warranty & Service

NK does not believe in "disposable electronics." We know our products don't lead a pampered life, and we design them for years of performance in tough conditions. We guarantee every NK product to be free of defects in materials and workmanship for a period of TWO YEARS from your date of purchase. We will repair or replace any defective product or part when notified within the warranty period, and will return the product via domestic ground shipping at no charge. The following issues do not result from a manufacturing defect and are not covered under this warranty: damage due to improper use or neglect, including corrosion; impact damage; modifications or attempted repairs by someone other than an authorized NK repair agent; normal wear and tear; failed batteries. NK wants you to be an NK customer for life, so we take care of you even beyond the terms of the normal product warranty with our Customer Care Program. Trade-in any NK display unit, no matter the age or condition, and receive a generous discount on the replacement product.

**Visit [www.nkrowing.com.au](http://www.nkrowing.com.au) at any time for detailed product specifications & troubleshooting guides.**