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Information for SIS/SAS Head Coaches, Coaches and Scientists

Protocol Modification: Power-Profile

V1.0 Created January 2009
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V1.3 Updated October 2011
V2.0 Updated October 2012
V2.1 Updated December 2012
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Table of Contents

Background	3
Revised power-profile tests	3
Frequency of the Power Profile	4
Structure of the Power Profile	4
Ergometer Drag Factors (Test Efforts 2-5)	5
Power Profile Test Administration	5
Preparation	5
Power-Profile Test Administration (Test Effort 1):	6
Power-Profile Test Administration (Test Efforts 2-5):	7
30 min R _{OPEN} Test Administration	7
Submission of ergometer test data	8
Data Template Download	8
Evaluation and implementation of the data	8
How can the ergometer test battery assist with training prescription and modification?	8

Background

After discussion at the recent Senior A National Team debrief it was agreed that a simple form of a power profile would be introduced back into the ergometer test battery for all aspiring National team members. The aims of the power-profile have not changed since its first inception back in 2009 but with its reintroduction into the National ergometer test battery we aim to make the battery easy to implement as well as ensure a bigger window of opportunity in which to collect the required information. Listed below are the original aims of power-profile;

1. It can provide highly useful information on the energetic continuum of each individual rower which should be used by coaches and scientists to infer changes in anaerobic capacity and maximal aerobic power
2. It is able to be undertaken on large groups of athletes at a single time and does not require the direct input / monitoring of rowers by trained sports scientists
3. Group data could be used by each coach to objectively assess the effectiveness of their training cycles since the last series of tests and ultimately plan future blocks of training based on strengths and weaknesses of each rower
4. Facilitate our elite group to become more reliable and better equipped to produce maximal efforts over race like distances with the aim to ultimately improve our “big race capabilities”

Lessons learned from previous implementations of the power-profile have demonstrated that the stated aims above are secondary to the pure performance aspects of the protocol. i.e. training related information was deemed less important (or even non-existent) and time to complete the distances became paramount. Although the competitive nature of our elite rowers should never be marginalised it is important to emphasise that the power-profile is a measure for the individual athlete only and reflects their current fitness traits and willingness to express their maximal capabilities over a number of test durations.

An opportunity to re-assess the effectiveness of a power-profile has presented itself. After lengthy discussion with senior coaches and Leadership Team at the recent debrief it was decided the Power Profile should undergo some restructuring for the 2015 and 2016 seasons. Changes will be made to the number of test distances / durations used in the profile, the time frames provided to undertake the profiles which athletes will be required to undertake the full profile and the number of mandatory test periods across the domestic and international seasons.

The major criticism of the original power profile was that it was a full week protocol that had the potential to disrupt routine training rather than be included as part of it. A main aim of the new power-profile is to ensure the profile forms a simple aspect of routine training, the test battery window is extended to provide every opportunity to complete the battery in a reasonable time frame and that the order of individual tests within the battery is inconsequential to the determination of the power profile continuum. It is an aim of the revised power-profile that the ARTeam designated ergometer trials / tests can form part of the power-profile and as such assist with easy implementation of the profile.

Revised power-profile tests

To complete a successful power-profile assessment 4-5 tests (over a variety of distances or times) must be completed at maximal intensity within a 2 week window. The timing of the revised power-profile has been placed with other designated ARTeam ergometer tests to assist with ensuring the athletes each get an

accurate snapshot of their fitness traits as well as minimising any disruption to routine training. Depending on the tier of the athlete required even the 4 minute maximal component of the 10+4 Laboratory Test can be used to form part of the power profile. The other tests that must be undertaken within a 2 week period (at a time that best suits the athlete and coach) are outlined below;

- Test Effort 1 (10 sec) – 7 maximal stroke test @ R30
- Test Effort 2 (40-60 secs) – 250m all out
- Test Effort 3 (4-8 min duration) – either the 4 minute maximal component of the 10+4 Laboratory Test or a 2000m test
- Test Effort 4 (15-20 min duration) – 5 km test
- Test Effort 5 (30 min duration) – 30 minute open rate test

The order of the tests outlined here are not important to the overall power profile and as such each athlete and coach has the choice to fit each of the test efforts into routine training over a 2 week period.

Frequency of the Power Profile

In previous iterations the power-profile was undertaken approximately 4-6 times per domestic preparation. In the first two years of the cycle there were more tests and in the last two years the Senior A team were given some latitude and the frequency of the tests decreased. Now that selection ergometer tests are required in December (5000m) and again in February - April (2000m) then the frequency of the revised power-profile should nestle in around those commitments and good training blocks. For these reasons the new Power-Profile and 10+4 Laboratory Test batteries will be required in early October, late January and March 2015 of the domestic preparation.

Test period 1: October 6 - October 19, 2014

Test period 2: January 26 - February 8, 2015

Test period 3: March 30 - April 19, 2015

These dates are also outlined in the National Training Blueprint which will be circulated in October.

Although the dates listed above are the mandatory ARTeam test dates it is encouraged that additional power profiles are completed if the need arises. As the power profile is simple to plan into routine training it is possible that additional power profiles could be completed in other key phases of the domestic season.

Structure of the Power Profile

The aim of V3.1 of the Power Profile protocol is to provide as much flexibility with the structure of the tests as possible in order to allow coaches to individualise the tests to fit with the training location and the athlete group. As such there is no set structure to completing the power-profile but there are some guidelines below in which to follow;

1. Test effort 1 should be completed with maximal force production at a fixed rate of 30 s/min and a high drag factor
2. Test efforts 2-5 should be completed as quickly as possible (i.e. maximal efforts) but with a strong technical focus
3. 30 min open rate test must be completed as the first test of the power profile as this set workloads for the 10+4 component of the profile (if being used as the 4-8 min duration test)

4. Other than completing the 30 min open rate first the order of the test is not prescribed and should be set to best suit the coach and athlete
5. All tests must be completed within a 14 day period
6. Athletes need to complete a single power profile measure in each of the 5 separate tests outlined above

Ergometer Drag Factors (Test Efforts 2-5)

As with all ergometer tests in the 2012-2016 quadrennium all tests will be completed on a stationary Concept II ergometer with each individual athlete choosing their drag factor. For standardisation of results it is strongly encouraged that drag factors not be changed either within the 2 week test period or ultimately across the domestic and international seasons. Listed below are the drag factor guidelines for each category.

Category	Stationary Ergometer
Heavyweight Men	110 - 140
Lightweight Men	90 - 120
Heavyweight Women	90 - 120
Lightweight Women	70 - 100
Junior Men	90 - 120
Junior Women	70 - 100

Ergometer Drag Factor Settings – Para Rowers

Category	Drag Factor
LTA	90 - 120
AS1X	90 - 120
TA2X	90 - 120

Power Profile Test Administration

Preparation

Equipment Checklist

- Concept IID or IIE rowing ergometer
- Heart rate monitor (can provide very useful information for some individuals)
- Stopwatch
- Lactate Pro2 analyser (can provide very useful information for some individuals)

- Data recording sheet or computer to access online data entry forms

Power-Profile Test Administration (Test Effort 1):

The start in rowing races is crucial for optimal performance and may be dependent on maximal anaerobic capacity and strength of the athlete. Greater force production and anaerobic contribution maybe possible in rowing compared with other endurance sports as rowing is relatively short in duration and requires a slow muscle contraction velocity. Thus measures of strength and anaerobic capacity are important objectives in rowing performance.

A seven stroke test may measure strength and force production simply and add texture to the power profile test as well as additional information for Strength and Conditioning staff on the shifts in functional rowing strength.

Ergometer Drag Factors for Test Effort 1 (Seven Stroke Test)

To maximise the result in the test, its recommended that the peak drag is used.

Category	Stationary Ergometer
Heavyweight Men	140
Lightweight Men	120
Heavyweight Women	120
Lightweight Women	100
Junior Men	120
Junior Women	100

Seven Stroke Test Administration

The seven stroke test can be administered as a stand-alone test, or completed after the warm up for any of the other power profile tests. As it is a short duration test it should not induce significant fatigue that would affect performance in the following test.

1. The athlete should weigh-in and report the weight to the supervising coach or scientist
2. Adjust the ergometer drag factor to that appropriate to the category (see Drag Factor Settings table above)
4. Undertake individual warm-up
5. Select 20 seconds on the Concept 2 work monitor and display power and SR in large font
6. The athlete performs 7 maximal strokes at a stroke rate of 30 s/min
7. The scientist counts and records the displayed power output (watts) for each stroke
8. 10s mean power is calculated as the average power from the 5 highest consecutive readings.

Expected Senior A score:

- Heavyweight men 660W
- Lightweight men 500W
- Heavyweight women 390W
- Lightweight women 300W

Power-Profile Test Administration (Test Efforts 2-5):

Athletes will be allowed to individualise their warm-up prior to each ergometer measurement but are asked to replicate as closely as possible the same specific warm-up adopted for each distance the next time they undertake the test.

The following list represents the order in which each test should be completed.

1. The athlete should weigh-in and report the weight to the supervising coach or scientist
2. Attach a heart rate monitor (mandatory) and ensure it is working correctly
3. Adjust the ergometer drag factor to that appropriate to your category (see Drag Factor Settings table above)
4. Undertake individual warm-up
5. Select the appropriate distance (or time for the 30 min test) for the ergometer test on the Concept work monitor
6. Start rowing when instructed by the coach or scientist
7. Complete the required distance in the shortest possible time with a high technical focus
8. At the end of the test, the coach or scientist will record the relevant data from the work monitor
9. An earlobe or fingertip blood sample can be collected immediately and 4 min post completion of the test.

30 min R_{OPEN} Test Administration

Athletes will be allowed to individualise their warm-up prior to each ergometer measurement but are asked to replicate as closely as possible the same specific warm-up adopted for each distance the next time they undertake the test.

The following list represents the order in which each test should be completed.

1. The athlete should weigh-in and report the weight to the supervising coach or scientist
2. Attach a heart rate monitor (mandatory) and ensure it is working correctly and the data is being recorded (minimum of 1 min intervals) on the Concept II work monitor or athlete's watch
3. Adjust the ergometer drag factor to that appropriate to the category (see Drag Factor Settings table above)
4. Undertake individual warm-up
5. Select time on the Concept work monitor and ensure the data is being recorded at 2 min intervals for later analysis
6. Start rowing when instructed by the coach or scientist
7. Complete as much distance in the 30 min allocated time as possible (there is no rating cap)
8. At the end of the test, the coach or scientist will record the relevant data from the work monitor on the supplied data template; av. power, av. stroke rate, av. heart rate, distance covered and RPE
9. FTP is calculated as the average power from minute 5 to minute 25 (20 time points) or estimated by 30 min OR power x 0.98:

10. An earlobe or fingertip blood sample should be collected and analysed at the completion and 4 min post completion of the test (if available)

Submission of ergometer test data

The ARTeam uses an XL based spread sheet as the only way to submit Power Profile ergometer test data and 30 min R_{OPEN} test data. Data is to be submitted to your respective State High Performance Coordinators in a timely manner and they will forward the information onto me. If you require a copy of the XL template please contact either your State HP coordinator or myself (Tony.Rice@rowing.ausportnet.com). If for any reason an athlete is unable to begin or complete any of the test battery (including the 30 min R_{OPEN}) this must be recorded in the appropriate data template and an accompanying medical exemption forwarded to the Sports Medicine Coordinator (Larissa.Trease@rowing.ausportnet.com).

Data Template Download

Download the data templates here:

30 min R_{OPEN} Data Recording:

<http://storagemadeeasy.com/files/ed7c0dfc37236169bca4c57ce6db2f39.xls>

10+4 Laboratory Test Data Submission:

<http://storagemadeeasy.com/files/ab5653c77161c5a8a23b21ec790fc307.xls>

Power Profile Data Submission:

<http://storagemadeeasy.com/files/cf9d990f2e4bb3d8f8fe38ebbc062850.xlsx>

NB. Please use the Power Profile Data Submission template to submit any 30 min R_{OPEN} data

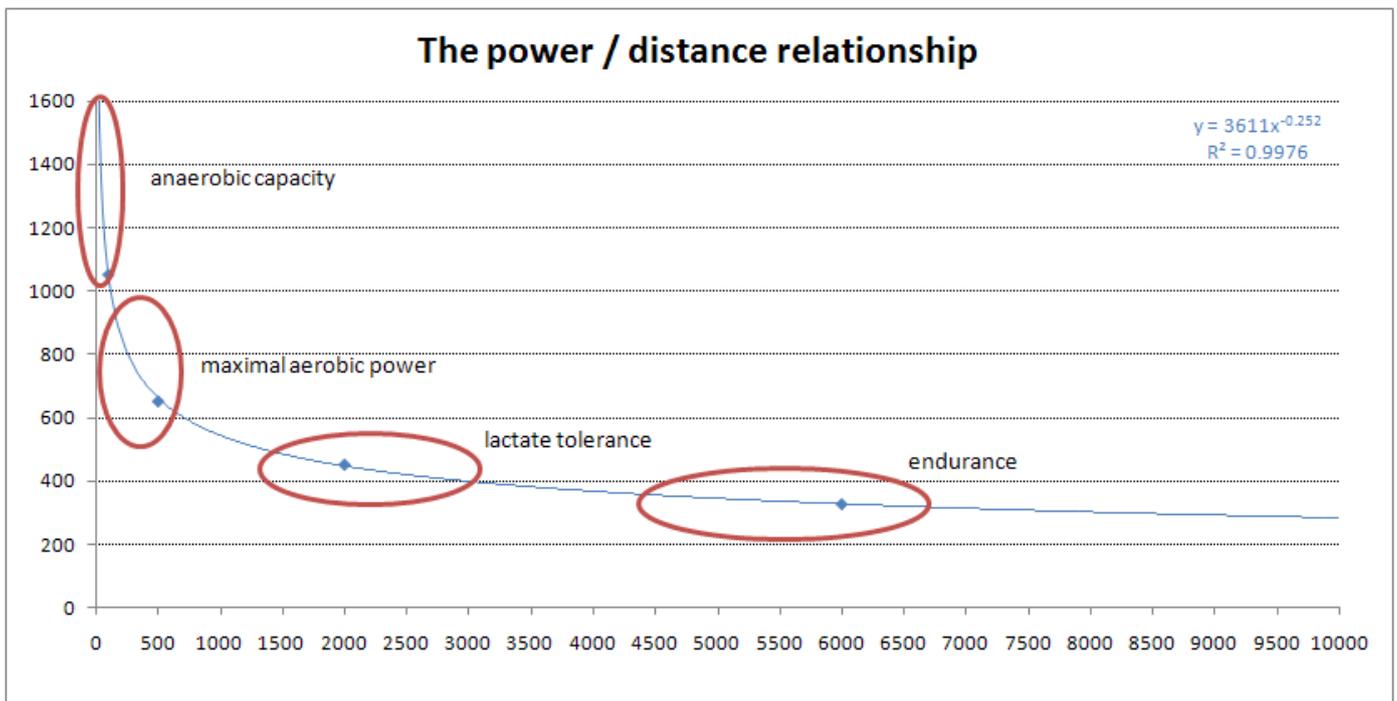
Evaluation and implementation of the data

The final aspect of the delivery of the power-profile, which needs significant improvement across the country, is the evaluation and implementation of the data to confirm or adjust training. It is critical to the uptake and effectiveness of the protocol that the information gathered is used appropriately to assess change within an athlete's physiological profile as a result of training. It must be the responsibility of your SIS/SAS scientist, in collaboration with you and the National Lead Physiologist to undertake a review of each athlete's data with respect to the training they have completed and the aims of the relevant training cycle. Tools for the effective evaluation of the power-profile data are available. Please find below the original document which outlines how best to use the data from the power-profile.

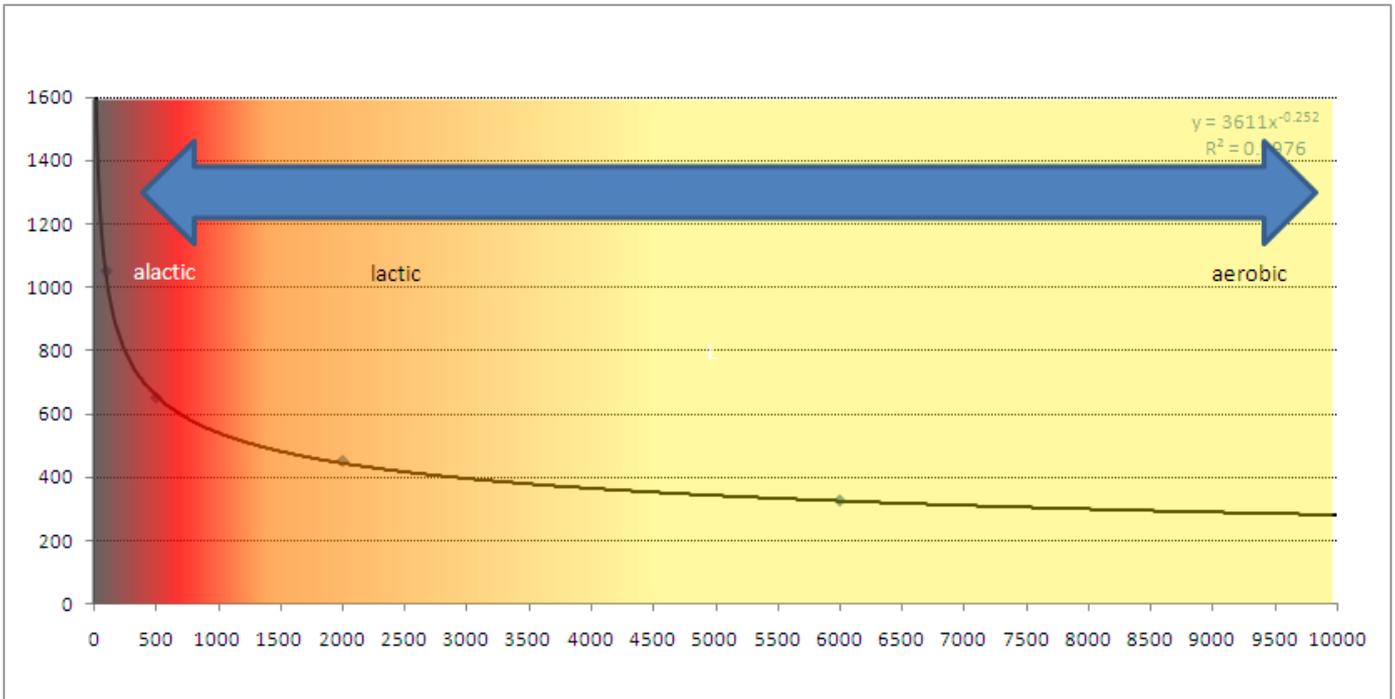
How can the ergometer test battery assist with training prescription and modification?

The relationship between power output and time (or ergometer distance as it can be expressed in rowing) has been used for decades to measure shifts in a variety of fitness traits within an individual as a result of

training or detraining. The power / time continuum (sometimes referred to as Critical Power) is currently used by the Danish rowing association to tailor training programs to meet the individuals strength and weaknesses of their elite rowers and is based on the assumption that different power outputs have varying levels of sustainability governed directly by the interrelated energy systems available to fuel mechanical work (i.e. alactic, lactic and aerobic). Quite simply the test battery asks the question; “Given full fuel reserves how quickly can an individual complete a set amount of work”? The Danish test battery requires each athlete to complete a maximal test over 10 sec, 60 sec, 2000m, 6000m and 60 min in a one week period. From the data, a power output / time relationship for each athlete is established and then compared with their previous data as well as with data from other athletes. In the diagrams below a power output / distance relationship (vertical axis and horizontal axis, respectively) is shown for four distances (100m, 500m 2000m and 6000m) and the curve fit demonstrates how the continuum is established.

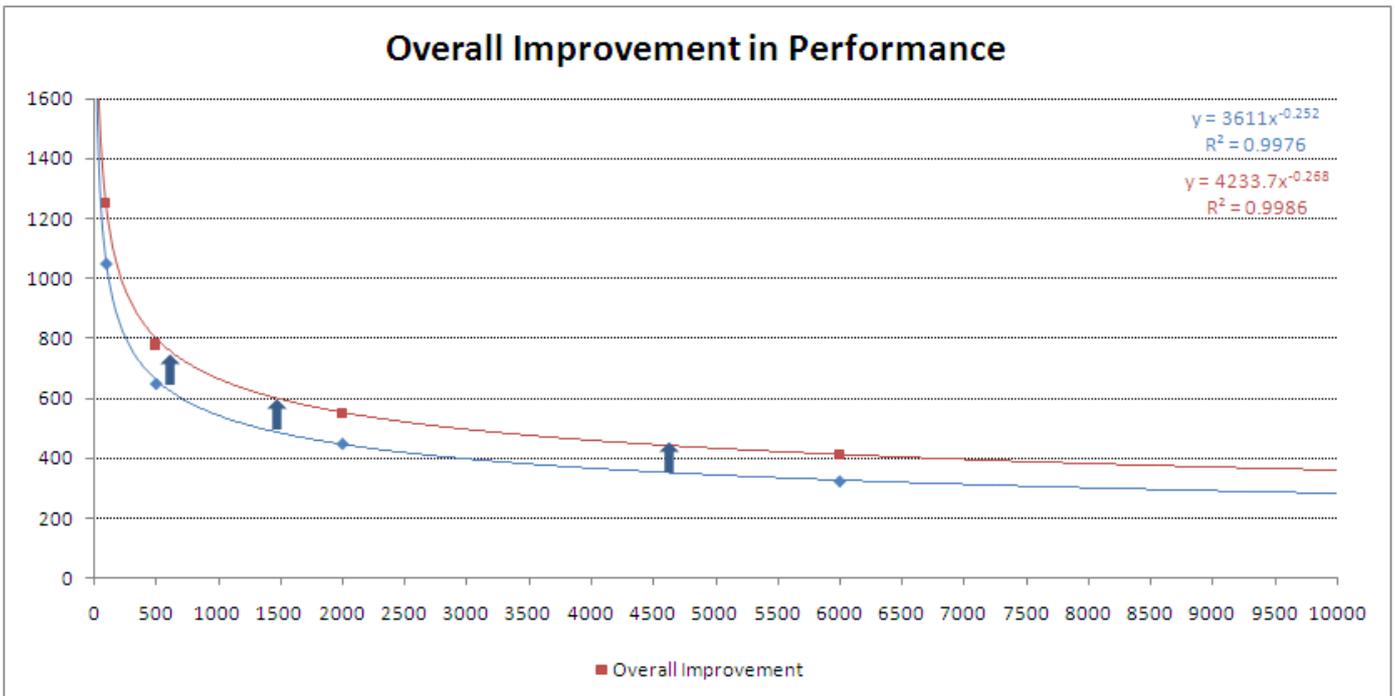


The analysis of the data obtained from a power / distance continuum can be very powerful as it can show how specific fitness traits can change with consistent and specific training but how these traits in some cases have only a small, if any, transfer to other distances (i.e. 100m improvement will have little effect on 6000m performance).



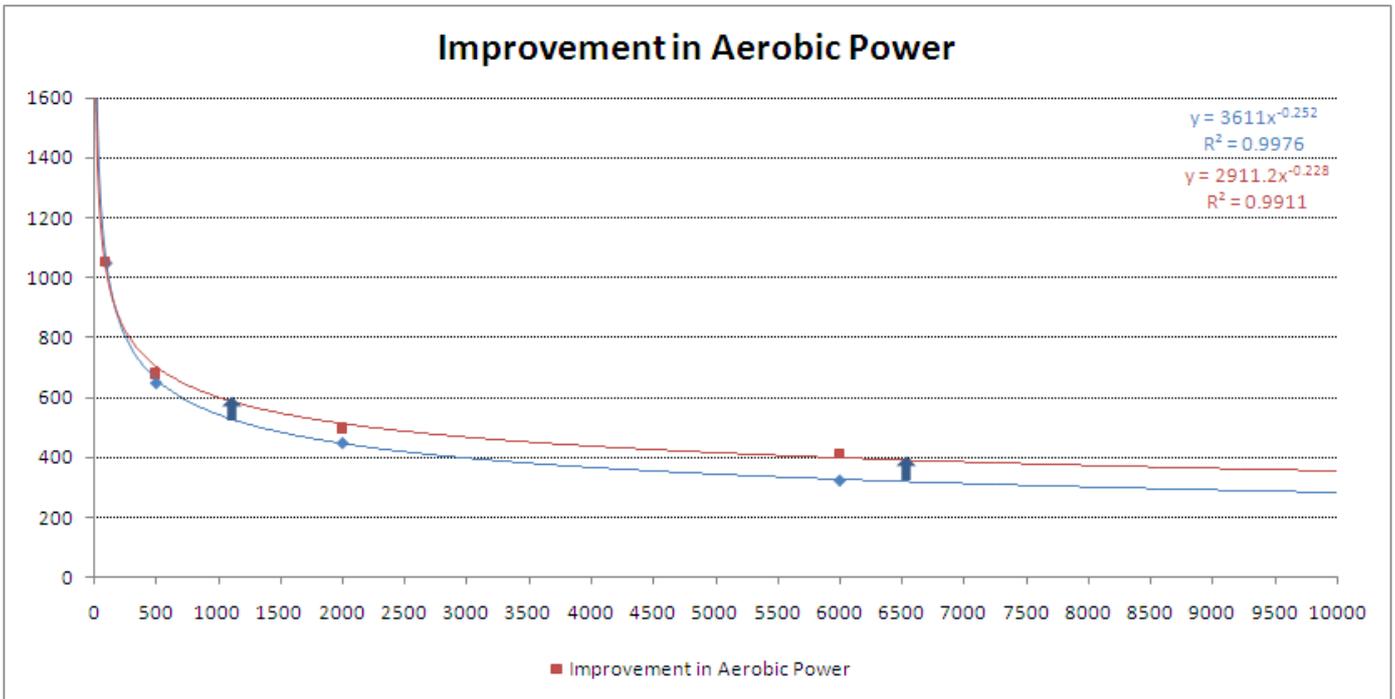
The energy supply continuum displaying the energy systems which are utilised across different ergometer distances

Consider the 3 examples below; the first graph shows an upward shift in the entire curve suggesting that all fitness traits (alactic, lactic and aerobic) have shown a significant improvement as a result of training.

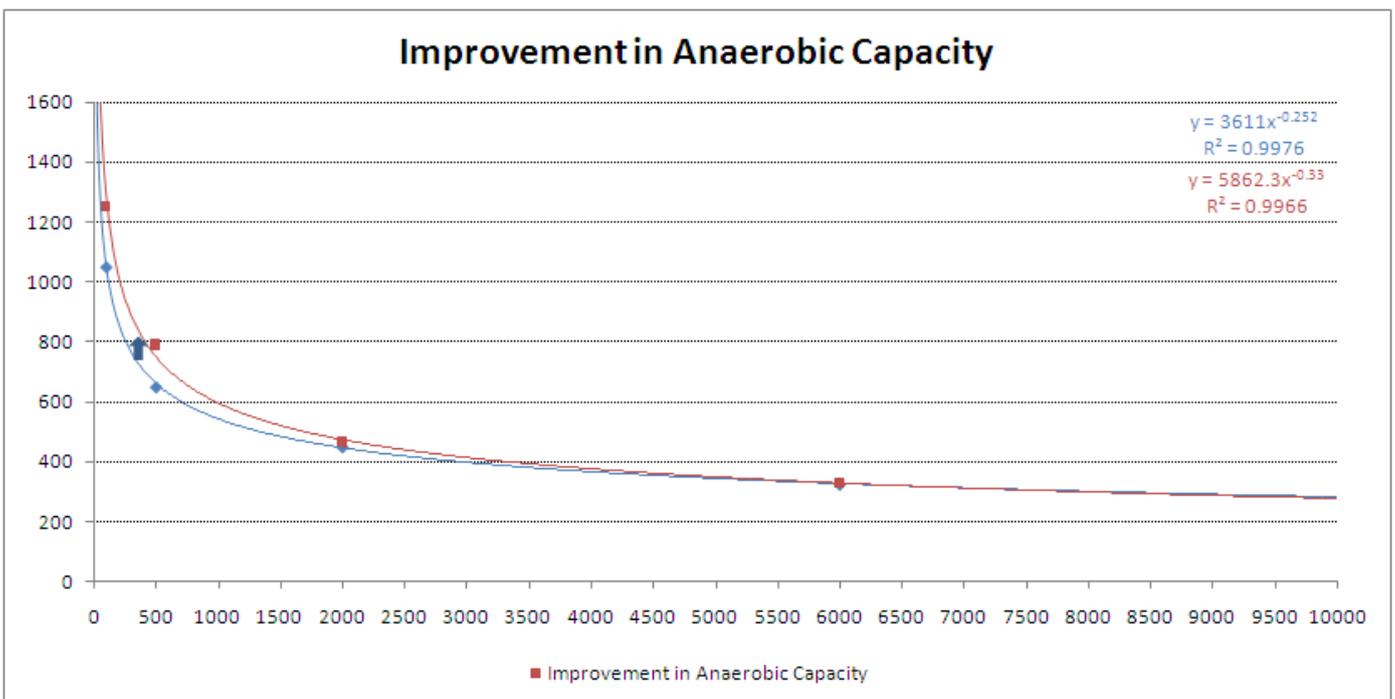


In the next example there has been a greater upward shift in the longer distances than in the shorter distances suggesting an important improvement in aerobic and lactic energy systems but not so in the

alactic. This may be representative of what Australia typically sees in the 1st phase of the domestic season (Sept to Jan).



In the final example there has been no shift in the medium and long distance power outputs but an important upward shift in the power outputs that can be exhibited over the shorter distances. This would suggest an improvement in alactic and lactic systems but no improvement in aerobic pathways. This example would represent improvements in rowing specific fitness that we may see later in the international season although this is purely speculation as we rarely measure these variables at this time.



Given these examples, it is hopefully clear how regular measurement of ergometer performance of our rowers can guide and individualise training prescription and well as assist with evaluation of the success of a specific training block. Quite simply, the test battery does a simple strength and weakness assessment across the specific fitness traits required by rowers without the need to undertake laboratory tests or time out from the routine training environment. This battery has the ability to display changes that are expected to occur in a rower's fitness throughout both the domestic and international preparations. Importantly, the rower and coach are able to immediately gauge their progress and in turn design training cycles that can address weaknesses during the early phase of the season and enhance strengths later in the international season.