Diagnosis from the race: the H-Graph

Par. 1 - Introduction

Hereby shown are the techniques for video analysis used by Andrea Pace since 2010.

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I would like to take this opportunity to thank Jernej Župančič Regent, my friend and fellow canoe trainer, for his expert knowledge and insight on kayaking techniques. Jernej seeks to understand, apply and develop my work, and pushes me to publish it in English. Since 2012, he has been using H-Graphs and has also included them in his trainers' handbook as the clearest, most efficient way to show the connection between parameters such as speed, advancement, energy, and frequency.
Lastly, I would like to thank my translator Eleonora Silvestri for her fast, impeccable work. For information please contact her at: esilvestri9@gmail.com

Paragraphs no. 2, 3 and 8 show the strategic behaviour in an ideal race (with regards to kayaking and rowing).
Paragraphs no. 9 (kayaking) show the strategic failure of crews who experience observable technical difficulties despite being in an World Cup final.
On this article we will analyse the races by obtaining boat speed and frequency of movement from video and GPS data.
From a mechanical and hydrodynamic point of view, we can obtain important information from the relationship between speed and frequency. The graph is constructed so as to provide the crew with several strategic choices.
We will distinguish between the following optimal race types:
- Where the distance covered (advancement) per stroke is constant;
- Where the energy applied per stroke is constant; and
- Where the frequency is constant (debatable).

We are able to verify whether the crew is proceeding in a disorderly fashion or in ways that do not accord with the laws of hydrodynamics; the worst case scenario being that in which the crew increases the frequency without obtaining an increase in terms of speed, or, worse, actually decelerates.

Par. 2 - The H-Graph for K1 1000m.

In the **Fig. 2** we will analyse the following race:
U23 Men K1 1,000m | Montemor-o-Velho 2015
Alternatively, please follow the link:
https://www.youtube.com/watch?v=9i7o8Qdyogg
The pictured graph will from now on be referred to as an H-Graph. We will show how it has been built step by step in the next few paragraphs.

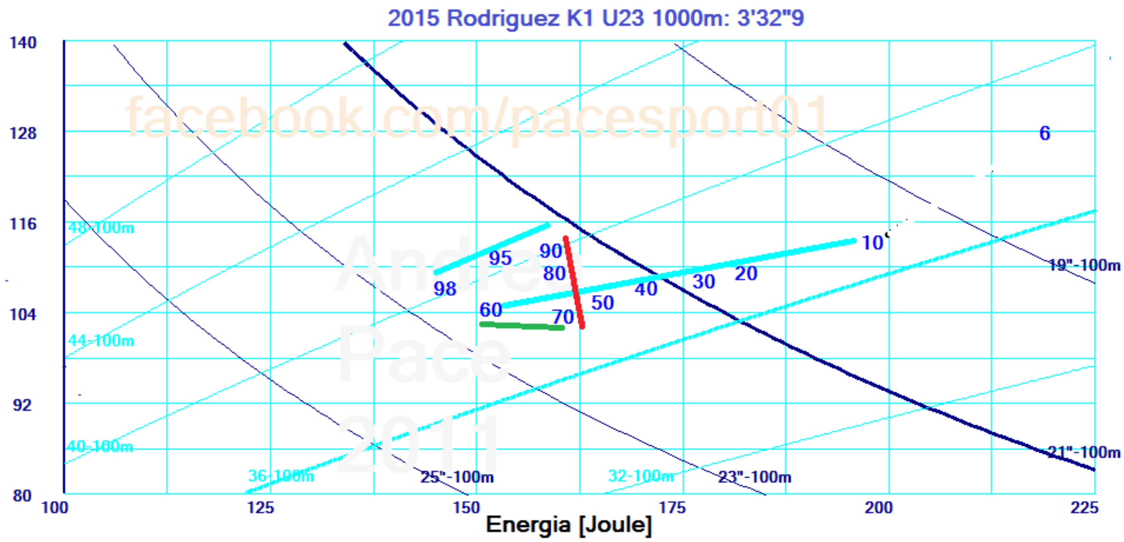


Fig. 2

It is best, at first, to simply observe the race, before viewing it once again at a later point by comparing it to the graph. The coloured segments correspond to the different tactical strategies employed by the crew.
The numbered labels show the distances in terms of meters x 10: therefore the 700m to 900m section (red line) corresponds to the following labels: 70, 80, and 90.

Par. 3 - The H-Graph for M2x 2000m.

To see how to make the calculations and construct an H-Graph please refer to paragraph no. 04.
In the present paragraph we will show a crew with an H-Graph that is very similar to that shown for the K1 (**Fig. 3**).
We once again advise you to first watch the entire race, and then review the parts of the race that are shown in a different colour on the graph.
Title: World Championship 2015 M2x Sinković
Link: https://www.youtube.com/watch?v=OWJw3wtQpK4

Par. 4 - The empty H-Graph for your data.

First you will need a blank graph on which to insert your data (**Fig. 4**). In the following posts we will show you how to calculate speed, advancement and energy. On the graph, speed and advancement are shown with dark blue and cyan curves.

The graph has two main benefits:

1) It enables the comparison of data obtained during training with data obtained during the various stages of the race; and
2) It enables an evaluation of the crew's behaviour during the course of the

race as the frequency of movement and the boat's speed change.

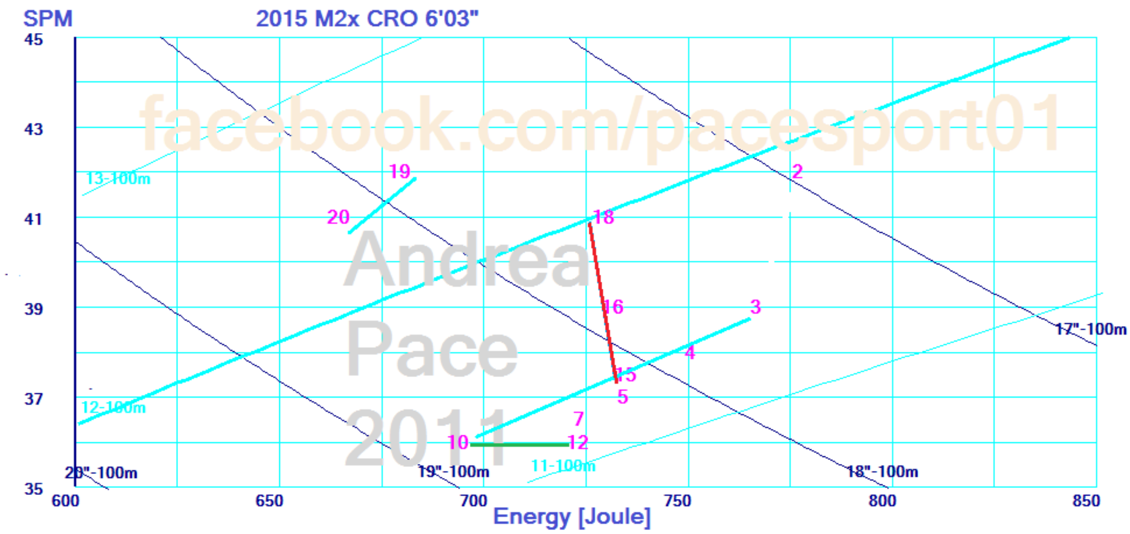


Fig. 3

Some modes of race have been predicted academically, and as we have seen are used by some of the best crews. These are:

- Energy-saving mode, with advancement remaining constant as the speed changes (central and final parts of the race);
- Maximum-performance mode, with energy per stroke remaining constant as the speed changes; and
- Wrong modes, where we try to identify technical mistakes.

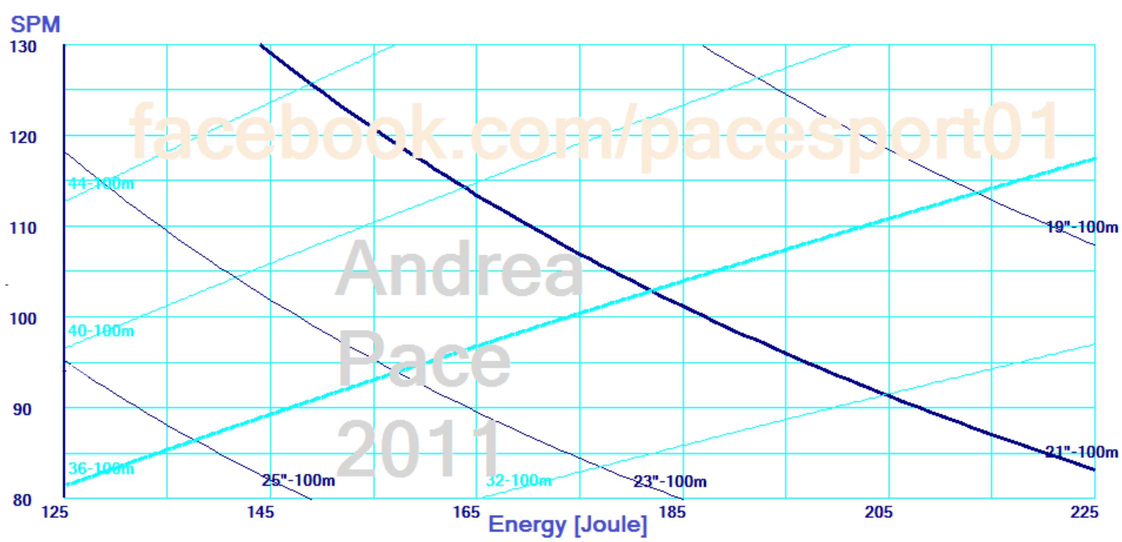


Fig. 4

Par. 5 How to input data into the graph

Now we will demonstrate how to input data into the graph (**Fig. 5)**.

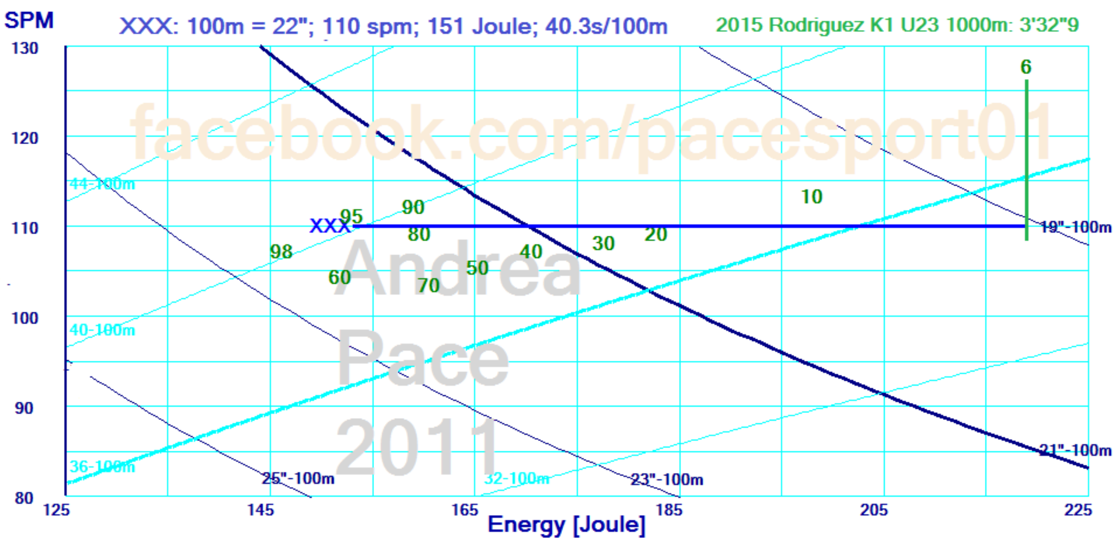


Fig. 5

The following are examples of statistics for a K1 athlete undergoing training:
Speed: 22 seconds per 100m.
Stroke frequency: 110 per minute.

In order to input this data into the graph (marked XXX in blue), we must first calculate the average energy applied to each stroke. In order to do so we will use the following formula:
Energy = K x Speed^2.6 x duration_stroke
Energy = 5.393 x (100/22)^2.6 x 60/100 = 151 Joule

Shown on the graph are the curves pertaining to the number of strokes necessary to advance 100m. According to our example it follows that:
N = Time100m / duration_stroke
N = 22 / (60/110) = 40.3 stroked in 100m
The advancement per stroke is 100/40.3 = 2.48m.

The point marked XXX on the graph shows the data relative to the final parts of Rodriguez's race. We should not believe that he emulated the champion, as we must consider possible physical fatigue when nearing the end of a race.
The table shown in paragraph no. 06 shows that athlete XXX has power in the amount of 267 Watts. The first measurement in Rodriguez's table is 466 Watts (at 60m, marked '6' on the graph).

We can therefore make two important points:

3)In the 1000m race, at 950m Rodriguez applies an amount of power that is 40% less that that applied at 60m (100 x 283 / 466 = 60%). This is surprising, because it would appear from the video that the athlete is the only one not displaying symptoms of fatigue.

4) During training, our athlete XXX will be able to reach Rodriguez's level if he applies merely 60% of his potential power. This could be because of fatigue or because of the use of a hydrodynamic brake.

In order to avoid unnecessary calculations, we can make better use of the graph. If we cross the horizontal blue line at 110 SPM with the amount of energy in Rodriguez's stroke at 60m (marked '6', vertical green line), we can see that it is close to the blue parabolic curve corresponding to a time 19"/100m. This indicates the amount of speed that the athlete should maintain at 100m (19") to have the same stroke energy as Rodriguez did at 60m.

The cyan curves (which appear to be almost straight) represent the set of the points with equal advancement per stroke. This is very useful when one cannot use a stopwatch: the athlete is made to follow the metronome set at 110 stokes per minute, and cover the 100m with a total number of strokes that is less than 36. In this way, the athlete will obtain a T100m that is less than 19".

It is clear, however, that even if the athlete does achieve 19" at 110 strokes per minute, this would still not be enough to win the race.

In the next two posts, we will see how the Austrian athlete Kornfeind, participating in the same final as Rodriguez, overtook everyone else at 200m and crossed the finish line with a 5" delay.

We have therefore seen how stopwatch and metronome trials applied to distances inferior to those of a race are only significant in relation to technique and efficiency. Trying to obtain numerical outcomes without improving technique may actually be counterproductive.

Par. 6 - Data tables for K1 and M2x.

For the sake of completeness, below is the data – presented in table format – relating to the graphs shown in paragraphs no. 2 and 3.

Double "M2x CRO 2015":

cm	T100	Spm	Joule	Watt	n/100
2	16.39	42.0	849	594	11.47
3	17.24	40.0	781	521	11.49
4	17.54	37.0	808	498	10.82
5	17.86	37.0	771	475	11.01
7	18.30	36.5	733	446	11.13
8	18.52	36.0	721	432	11.11
12	18.18	37.0	736	454	11.21

18	18.10	37.5	734	459	11.31
19	17.86	38.0	750	475	11.31
20	18.20	38.0	715	453	11.53

K1 “Rodriguez 1000m U23 2015”:

dm	T100	Spm	Joule	Watt	n/100
6	18.00	127.7	219	466	38.31
10	19.60	113.2	198	373	36.98
20	20.50	109.1	183	332	37.28
30	20.80	108.1	177	320	37.47
40	21.20	107.1	170	304	37.84
50	21.60	105.3	165	290	37.91
60	22.40	104.3	152	264	38.94
70	22.00	103.4	160	276	37.91
80	21.60	109.1	159	290	39.28
90	21.40	112.1	159	297	39.98
95	21.80	111.1	153	283	40.37
98	22.50	107.1	146	261	40.16

Key:
cm = hundreds of metres
dm = tens of metres
T100 = time necessary to cover 100m at current speed
Spm = strokes per minute
Joule = unit of measure of average energy per stroke
Watt = unit of measure of average power for each segment

At the outset it is more convenient to use a table rather than a graph. In order to make comparisons, however, it is necessary to use the graph for the purposes of establishing the athlete’s tendency at each identified point.

By ‘tendency’ we mean a precise circumstance that trainers are able to instinctively perceive, but that is difficult to express numerically. Looking at the graph we can identify the tendency by marking the segment that joins two consecutive points and comparing the angle with the reference curves.

We can compare the angle created by the marked segments with the four possibilities given by the graph (as if it were four-dimensional).

Please keep in mind that up to now we have seen graphs relating to crews of exceptionally high level, with a very small number and very precise ways of doing things. In the next few posts we will see some cases of athletes who, conversely, find themselves in grave difficulty.

The modes we expect to see during a race are the following:

5) Constant advancement mode (or close to this inclination) – marked in cyan. This advancement is equivalent to that of a vehicle moving on ground, e.g. a bicycle.
6) Constant stroke mode – a horizontal line, marked in green. In this case the frequency stays stable while all the rest varies according to speed.
7) Constant energy mode – a vertical line, marked in red: an increase in speed results in an increase in frequency and a decrease in the rate of advancement.
8) The worst possible mode is when the athlete alters every value except for speed. The points on the graph are arranged on one of the blue hyperboles that indicate T100 or constant speed. Obviously, maintaining speed while being in first place is desired. We will see later, however, that a crew that attempts to increase speed by increasing frequency but fails to increase speed to the desired amount is destined to finish near last. This and other outcomes are never determined by the crew's strategy, but instead tend to be the result of a technical problem that needs to be fixed.

Please note that the constant-speed curves are characterised by the time taken in the 100m and coincide with constant-power curves, or curves with constant average speed. The advancement curves are characterised by the number of strokes necessary to cover 100m (n100).

No explanation is provided with regards to the elements that entail the various modes that appear on the graphs, but it is possible to get an idea of this by comparing athletes in the different stages of the race. In other papers, that will follow the present one, we will proceed to analyse the differences between race modes in order to see which parameters change when the athlete chooses to prioritise efficiency, and when he or she chooses to prioritise performance.

The use of the H-Graph in tests is as follows: the athlete is given a task and his or her behaviour (mode) is then observed, in order to later compare its compatibility with the ideal race mode as conducted by champions. The tests can also be carried out over short distances and at several stages of fatigue.

In the next few paragraphs, we will see that with regards to the constant energy mode athletes opt for a determined energy value. This is due both to the athletes' characteristics and – mainly – to the boat set-up. It follows that in order to set the boats' speed and frequency parameters, other parameters, including advancement and energy, must also be taken into consideration.

It is crucially important that the boat set-up and the choice of materials be carried out in conditions in which the oars or paddles do not cause unnecessary turbulence in the water.

In the next few posts, we will also clarify the following issue: many trainers mistake energy for strength, and in this way commit a double fault. First, because they fail to consider that the advancement is not constant (and in the two reported cases this occurs precisely in correspondence of the red lines), and, second, because a decrease in the percentage of time on water compared to stroke duration increases the average power applied in the water but does not alter the average energy per stroke.

Here is the formula for the solution of the first out of the two problems. Those elements that contain tedious formulas for which the help of a physicist or a level four trainer may be required are written “in quotation marks”.

- “Energy = Power x displacement”

Therefore:

- “Average energy per stroke = Average power per stroke x advancement per stroke”

Because advancement decreases as speed increases with constant energy (please refer to the red segments on the graph), it follows that power must increase so as for the result to stay the same (on the graphs, the points where this happens are marked in red and trace a vertical line).

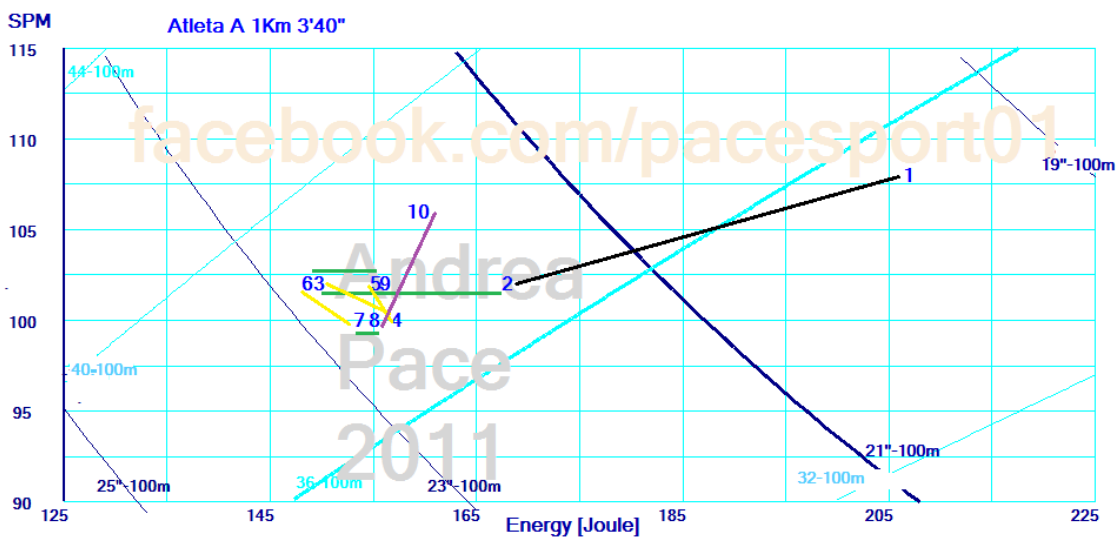


Fig. 7

Par. 7 - The H-Graph for K1 1000m for intermediate level.

The H-Graph in **Fig. 7** represents an athlete (in K1) of intermediate level. We are aware of the athlete’s technical issues – now let’s observe the effects that these technical issues have on the overall race strategy.

With the exception of race sections that go from 200m to 300m and from 500m to 600m (marked green on the graph), which are performed at a constant frequency mode, it should be noted that the remaining modes put in practice are not the same ones used by champions.

Please note in particular:

9)There are no sections that show constant advancement;

10) The sections marked yellow show a minor increase in speed combined with a decrease in frequency; and
11) The final section has nothing to do with the race pattern held by the champions we have previously examined.

Par. 8 - The H-Graph for LM4- 2000m.

If viewed in combination with a video of the race in question, the H-Graph provides information that can be used for the purposes of technique. Once we have analysed the race strategy, we can consider other types of measures.

Observation of the H-Graph highlights the strategic "modes" employed by the best crews – modes that conform to the principles of hydrodynamics and propulsion.

An obvious sign that something is wrong is when, during the race, the crew does not use the prescribed procedures. An H-graph makes it possible to detect at what point in the race the various problems occur.

Another crew worthy of imitation is the LM4-SUI. To watch the related video, please visit the following link:
http://www.worldrowing.com/events/2015-world-rowing-championships/lightweight-mens-four/

Below is the table showing the analysed results. Please note that the points not utilised (like 7 and 17) have been omitted as they are repetitions of the precedent and render the graph illegible.

2015 LM4- SUI

cm	T100	Spm	Joule	Watt	n/100
2	16.39	43.0	829	594	11.75
3	16.95	41.0	797	544	11.58
4	17.24	39.0	802	521	11.21
5	17.54	37.0	808	498	10.82
6	17.86	37.0	771	475	11.01
8	18.18	37.0	736	454	11.21
9	18.02	37.0	753	464	11.11
10	17.50	38.0	791	501	11.08
11	17.80	37.5	767	479	11.13
12	17.90	37.0	766	473	11.04
15	17.80	38.0	757	479	11.27
16	17.50	40.0	752	501	11.67
18	18.50	40.0	651	434	12.33
19	18.20	42.0	646	453	12.74
20	17.85	42.0	680	476	12.50

For this crew also, the race is conducted with a three-mode only strategy (shown in cyan, green and red) (**Fig. 8**).

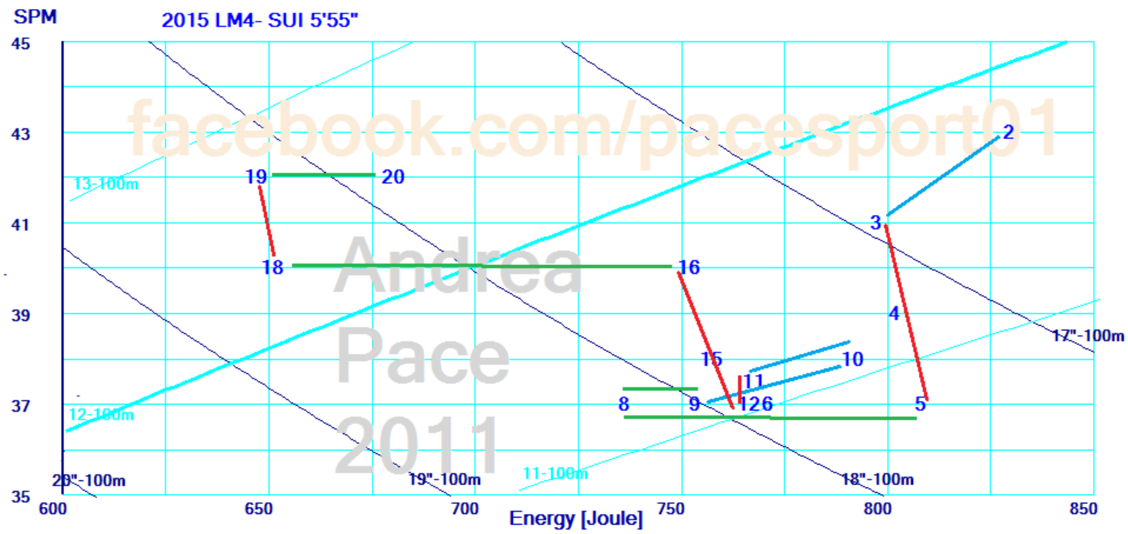


Fig. 8

Par. 9 Comparison of two k1

  We will now compare two athletes competing in the K1 2015 U23 World Championship Finals, specifically Kornfeind (AUT), who finished in fifth place (marked in blue on the graph), and Rodriguez (ESP) who finished in first place (marked in black on the graph).

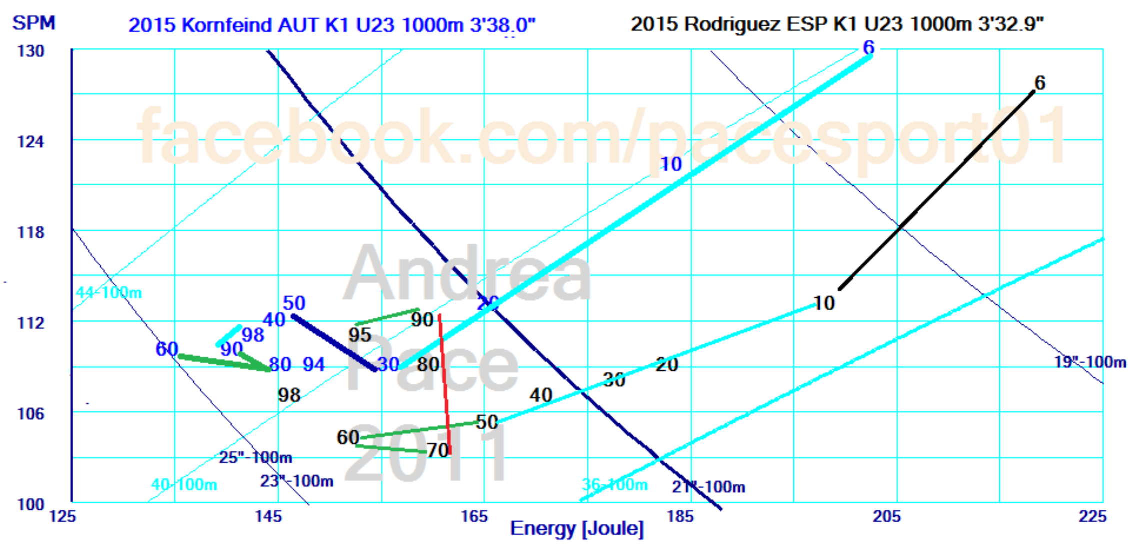


Fig. 9

When vieweing the graph in **Fig. 9** please the following in mind:

- The coloured lines (cyan, green, red and blue) represent the boats main modes of travel;

- The lines that trace Kornfeind's race are slightly thicker; and
- The numbers representing tens of meters are blue in colour.

Please also note that the reference video is the same as that in paragraph no. 2.

Instead of displaying the advancement per stroke, the graph shows the number of strokes necessary to travel 100m. The cyan-coloured curves – which are almost straight in appearance – represent the 36, 40 and 44 strokes per 100m. For example, on the 40-stroke per 100m line we can see the combinations *x* and *y* (energy and frequency) that correspond to that amount (with an advancement per stroke of 100/40 = 2.5metres).

Over several stretches of race, the athletes proceed by tracing lines parallel to the curves of constant advancement: this means that the boats travel similarly to the way a bicycle would, i.e. with a precise relationship between frequency and speed.

Despite being commonly observed among winning athletes, a considerable advancement does not guarantee maximum performance. When one trains by counting the number of strokes per 10m, 25m or 50m, for example, it is easy to concentrate on optimizing this result only, and to forget about, and therefore compromise, other technical aspects. The same can happen with any parameter used as feedback.

Parameters crucial to overall technique often tend to be disregarded. In the remaining part of this post we will see how this was the very issue encountered by the above-mentioned Austrian athlete.

We also provide information on speed using T100, which is the time taken to travel 100m at a given speed. The blue hyperbolic curves on the graph show values of 19", 21" and 23"/100m.

Trainers often think that they are training the athletes following race rhythm but, observing the graphs and tables, it is immediately evident that during the actual race the pace tends to fluctuate continuously. For example, even for the most regular of athletes, power is reduced by 40%. Similarly Rodriguez's stroke energy ranges from 210 to 150 joules during the race.

The graph and table show how Rodriguez, when crossing the 400m mark, is travelling at the same speed as that at which he crosses the 900m mark (T100 = 21.5"). The other amounts, however, are different – for example, advancement and frequency differ by 10%. Rodriguez's adaptation margins for the various levels of fatigue are therefore greater than 10%. This does not happen in Kornfeind's race. The latter's 3% frequency variation (from 300m to 500m, blue line), merely brings about a decrease in terms of advancement with no increase in terms of speed.

As previously discussed in post no. 7, those race sections that on the H-Graph appear to be parallel to the constant-speed curves make little sense: they are simply failed attempts at increasing speed.

A careful analysis of the race video shows how Kornfeind encountered problems relating both to the flowing of the paddle in water and to the poor management of the boat's pitching.

As we shall see in the next few pages, Rodriguez's parameters when crossing the 400m and 900m marks show a shift of the paddle sector from 100° to 90°. Since no flowing issues seem to appear, we can assume – provided it is later verified – that on the cyan-coloured constant-advancement section (100m to 500m), the athlete is focusing exclusively on efficiency. In the final 100m the athlete uses an alternative tactic that corresponds mathematically to a change in trasmission ratio, as if it were a bicycle. Please note that in this case the average power applied cannot be different at the two points in question, since the speed and conditions for acceleration are the same.

Strangely enough, the technique adopted in the last part of the race is more similar to the techniques used in the fastest races (500m and 200m): the strangeness here lies in the fact that in the final part of the race the boat travels at a lower speed and the advancement is more similar to that used in faster races, i.e. a lower advancement.

The above reasons show that the athlete must do a lot more than train on the basis of average race values: on the graph the mid point of the race is only one point. The athlete must be able to adapt his or her technique so as to obtain a good level of efficiency at all times during the race. This happens in a large area of the H-Graph with a variation of measured parameters ranging from 10% to 40%.

To obtain full information on a crew we therefore advise the following:

- Analysing the race using an H-Graph;
- Measuring the flowing of the paddle in water; and
- Evaluating the boat's pitching.

If, say, an athlete or crew shows a flowing of the paddle in water, this must be corrected by applying technique, and not changing it by trying to get around it.

Let's take a look now at how strategic needs have been addressed.

The greatest difference in the two graphs occurs when frequency is increased. Rodriguez does so at 700m in order to boost his advantage – the red line indicates energy per stroke that is almost constant. Kornfeind on the other hand increases frequency between 300m and 500m to avoid losing his third place. The method by which he chooses to do so (marked in blue), however, is not very rewarding: he raises the frequency by 3 strokes per minute but the boat's speed does not increase.

Between 100m and 200m, Kornfeind goes up to first place, where he is immediately flanked by Rodriguez. Essentially, when the two athletes are going at the same speed, the Austrian has a frequency which is higher by approximately 10 strokes per minute, whereas during the rest of the race the two athletes' stroke frequency is the same but Kornfeind has a lower speed and is behind Rodriguez by 5", meaning that he has approximately 10% less energy per stroke. In order to conduct a more detailed analysis, we must use the following formula:

- Energy = power x displacement

Since the Austrian athlete loses approximately 10cm per stroke (the flowing of the paddle in water is measured using the mid-race video), it follows that he must be applying the same power as his Spanish colleague, although for a shorter period of time. This shows how one must not solely increase strength in order to achieve advancement and stroke energy. The difference between the two athletes is due more to the propulsive performance and less to the metabolic power.

The above paragraph does not purport to assess what actually happened during the race, but simply to verify whether there exists a relationship between what happens in the race and the information obtained by taking measurements: this is the only way in which the marked information can be agreed upon.

When you look at the video of the two athletes and, in particular, their facial expressions, Kornfeind appears to display a great fighting spirit, whereas Rodriguez exudes calm. From looking solely at the graph, however, we would say the opposite is true: Kornfeind conducts a relatively "flat" race in which he first proceeds to increase frequency by 3 strokes per minute (with no increase in terms of speed), and then to slow down definitively. Rodriguez's race is calm and centred upon saving up energy until the moment when he increases his strokes by 10 per minute in order to boost his advantage and maintain his first place right to the very end.

The idea behind the above remarks is that an athlete who experiences technical problems does not possess the necessary margins to adapt to the various different race conditions and strategic requirements are disregarded completely.

Par. 10 Montemor 2016; ICF Canoe Sprint World Cup; Slovenian crews.

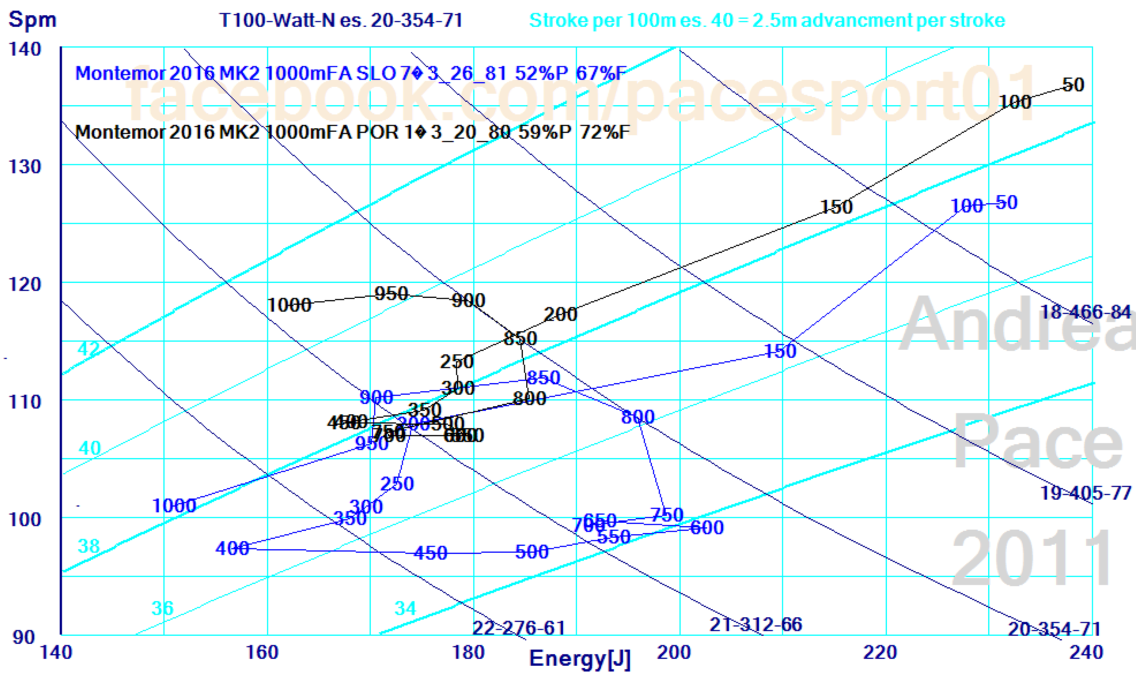


Fig. 10.1

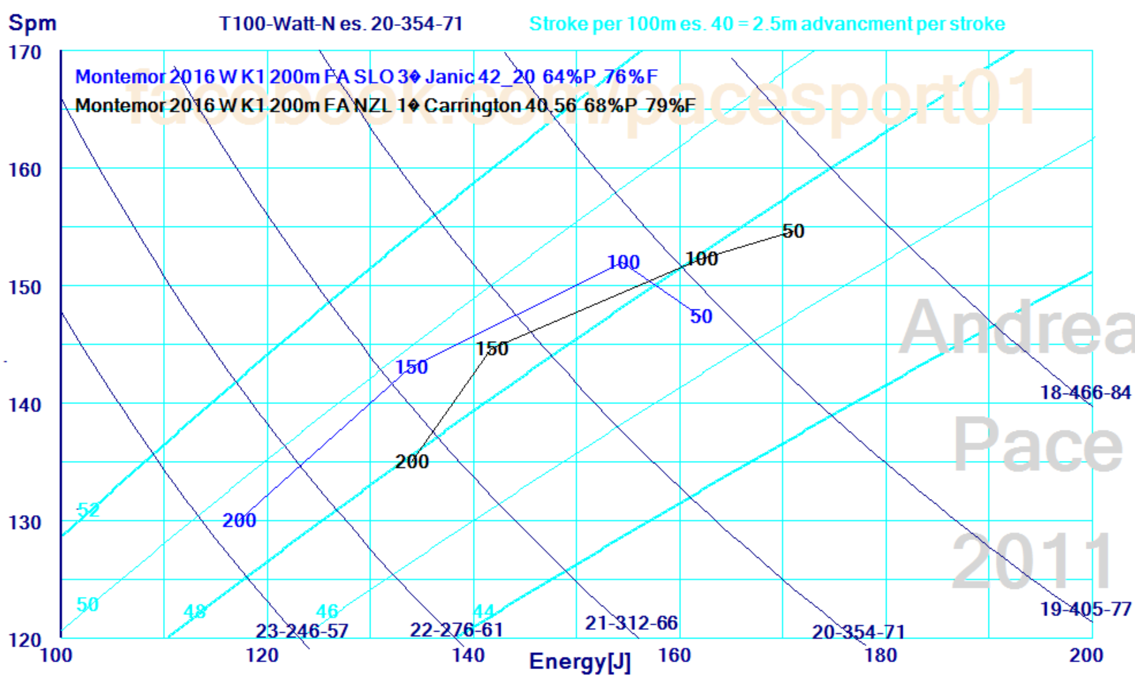
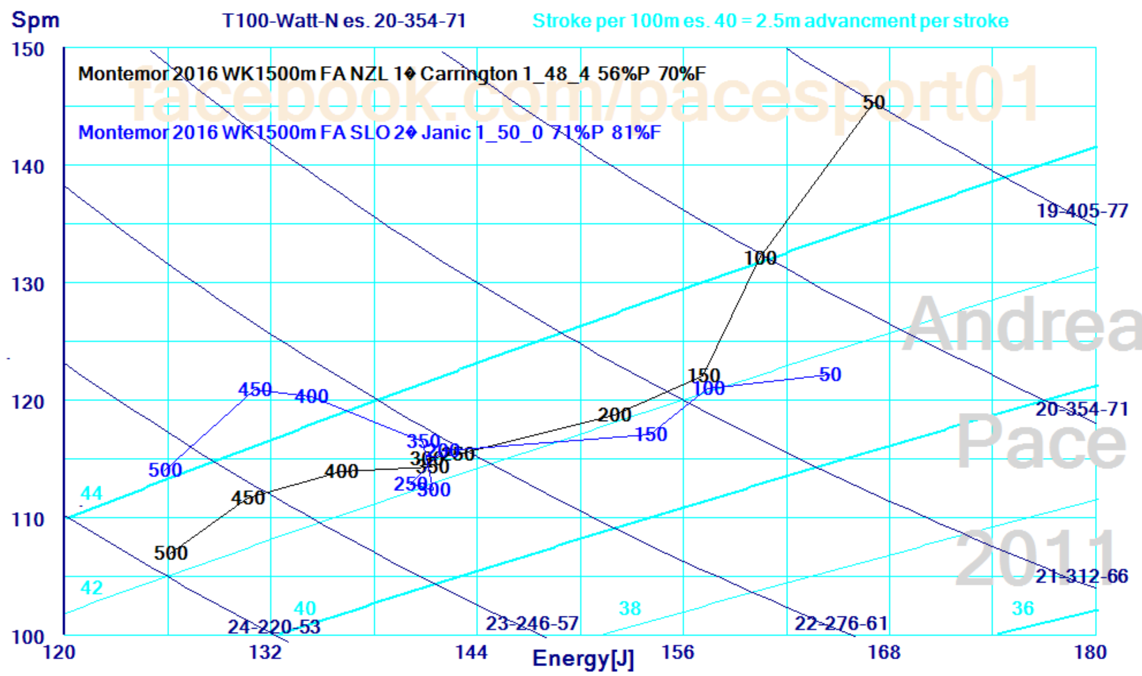


Fig. 10.2



Spm
T100-Watt-N es. 20-354-71
Stroke per 100m es. 40 = 2.5m advancment per stroke
Montemor 2016 WK1500m FA NZL 1� Carrington 1_48_4 56%P 70%F
Montemor 2016 WK1500m FA SLO 2� Janic 1_50_0 71%P 81%F
facebook.com/pacesport01
Andrea
Pace
2011
150
140
130
120
110
100
120
132
144
Energy[J]
156
168
180
19-405-77
20-354-71
21-312-66
22-276-61
23-246-57
24-220-53
44
42
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38
36

Fig. 10.3

Par. 11 2016 ICF Canoe Sprint World Cup

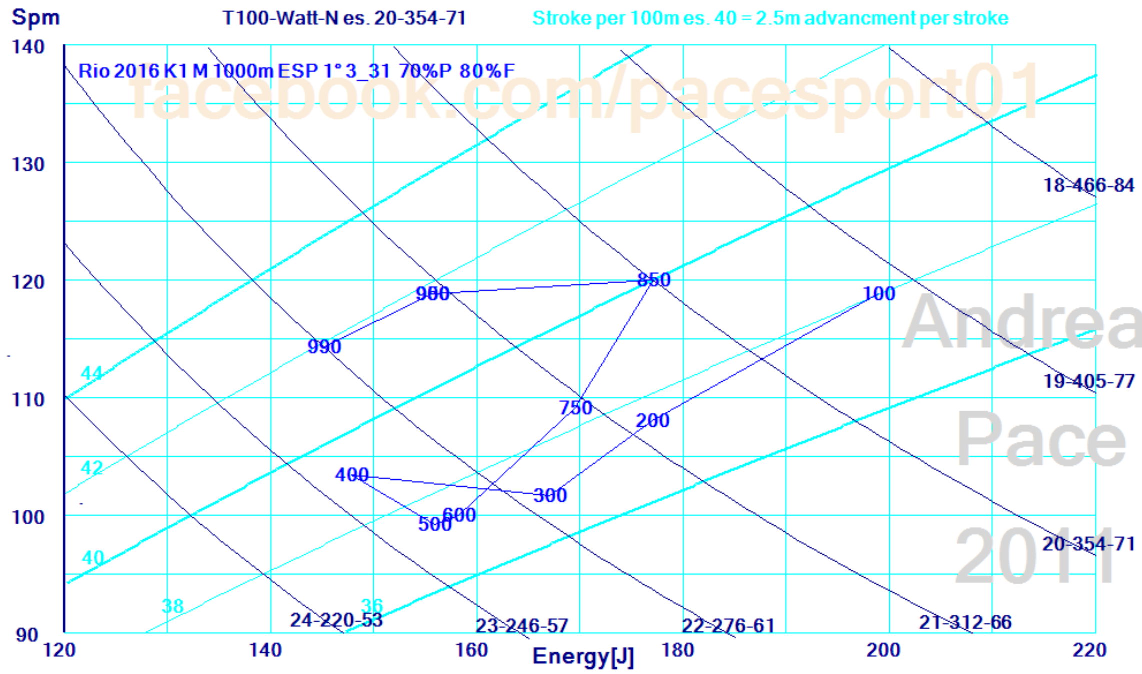

Fig. 11.1

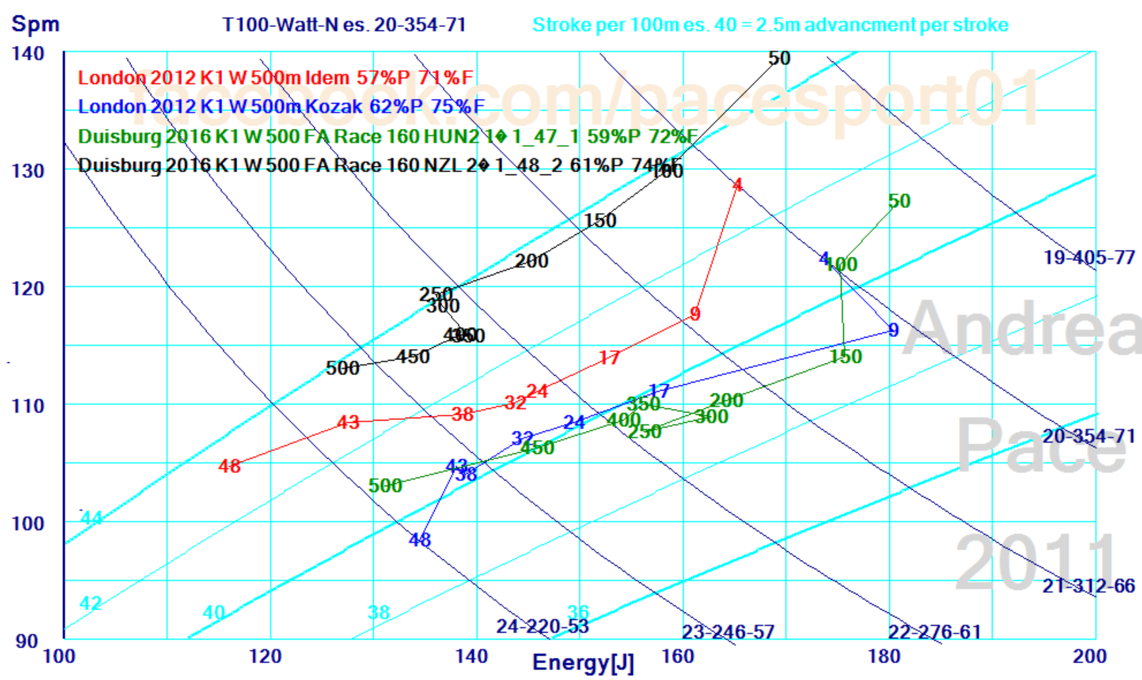

Fig. 11.2

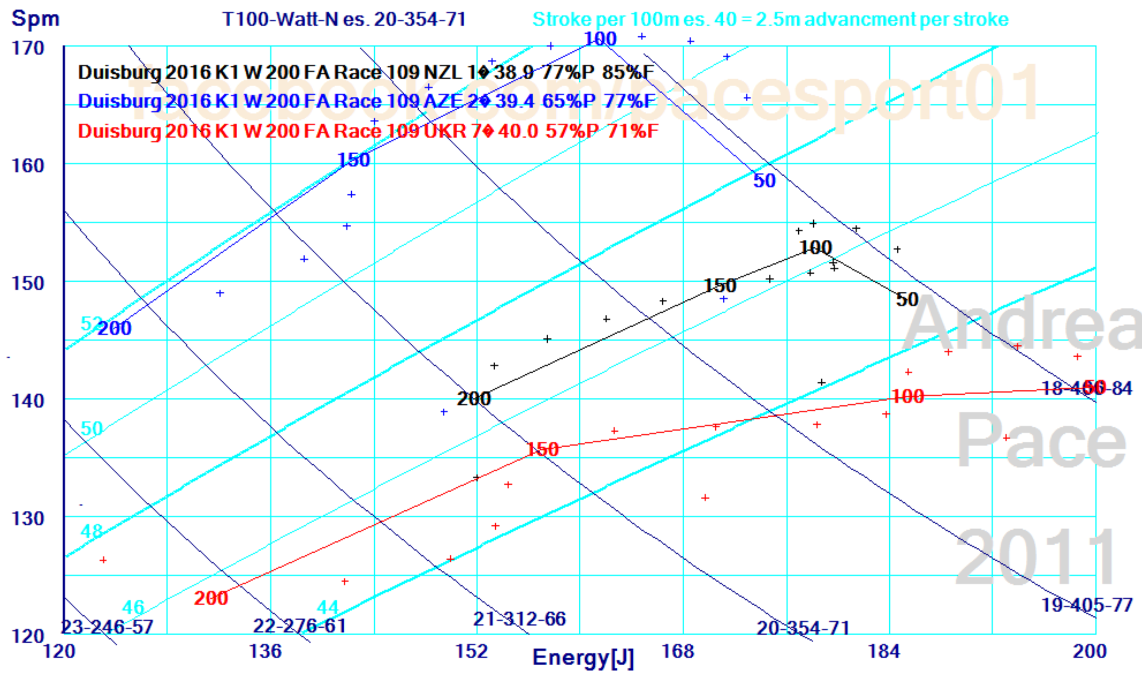

Fig. 11.3

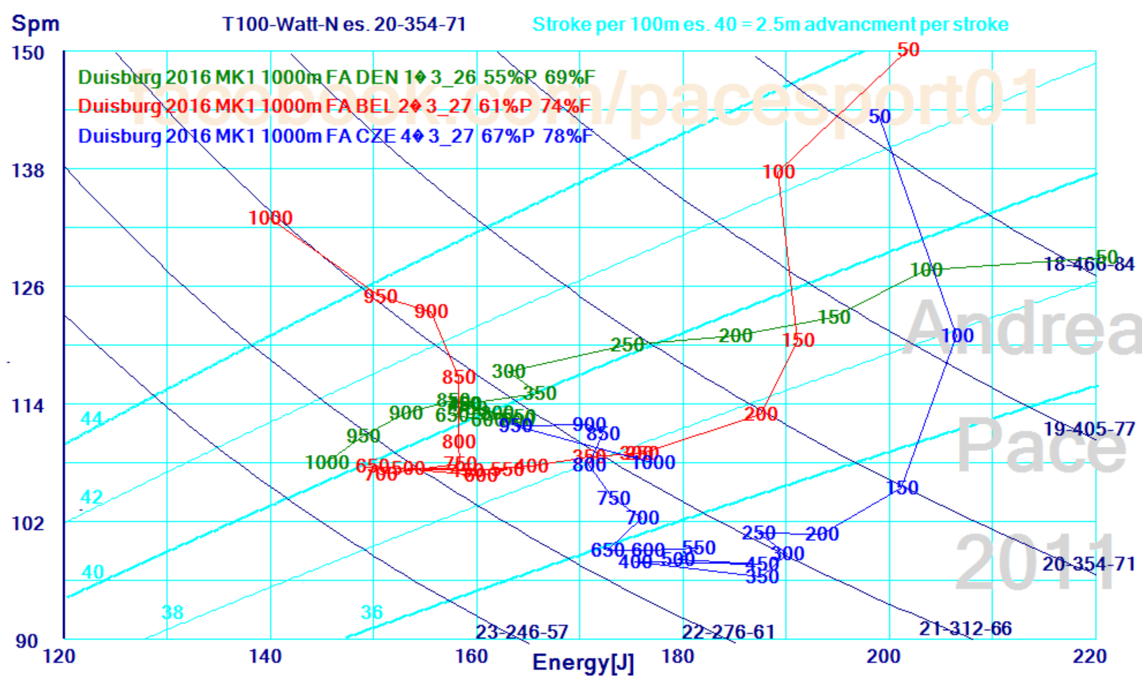

Fig. 11.4

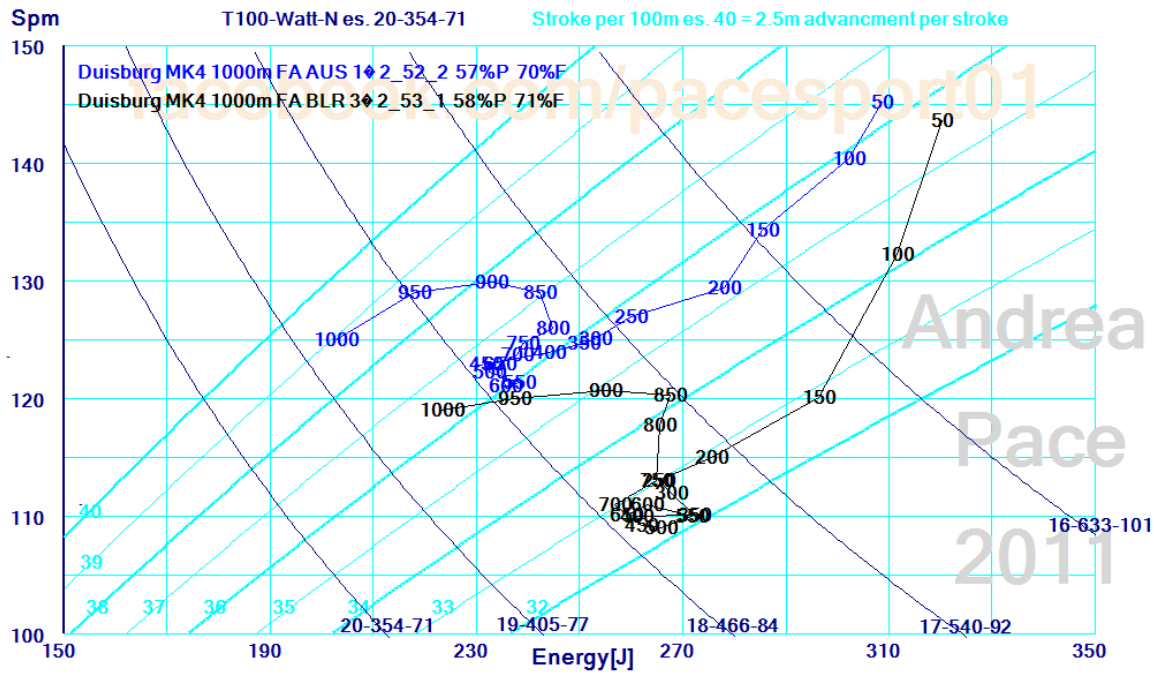

Fig. 11.5

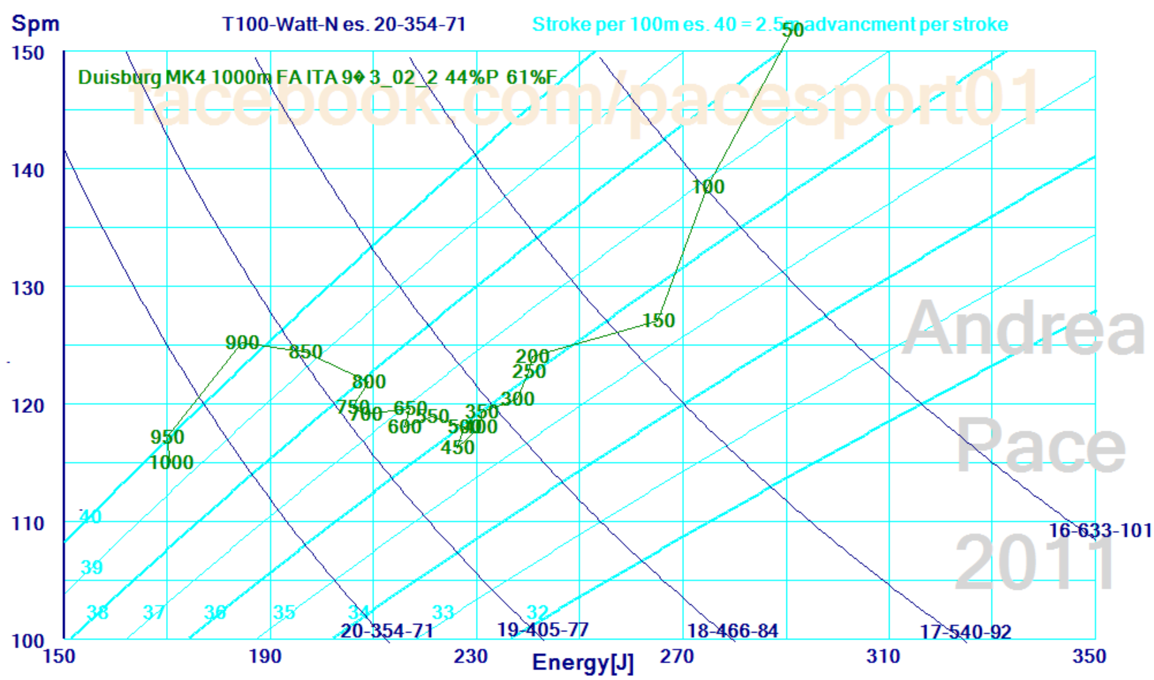

Fig. 11.6

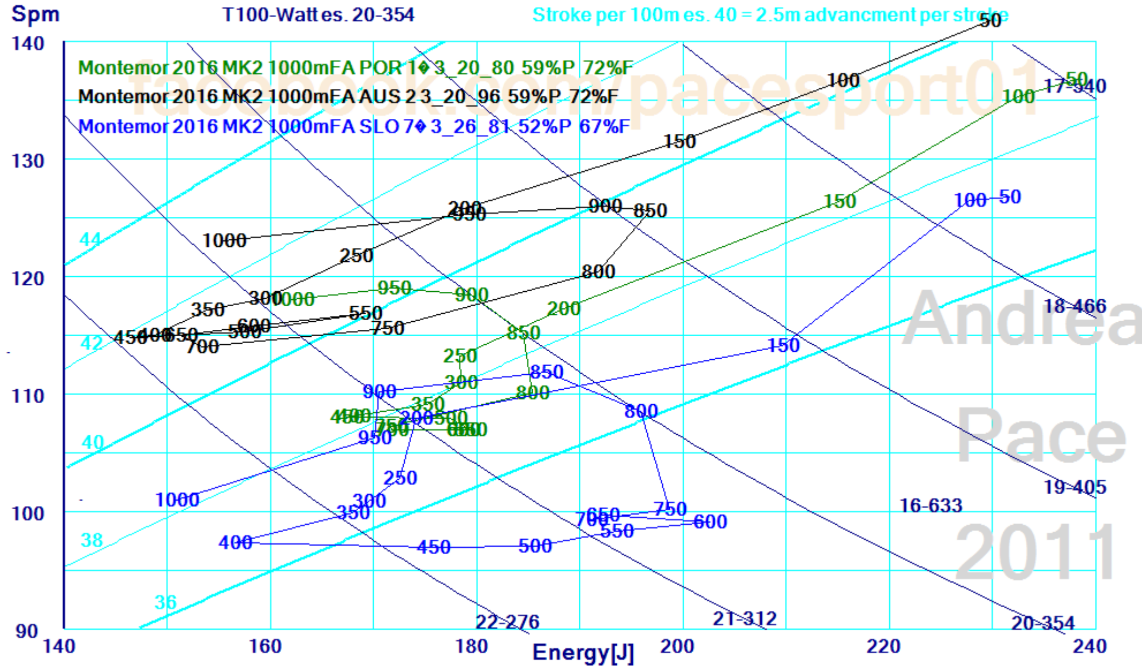

Fig. 11.7

04/06/2016 12:35 Race 41 Final A K2 Sen Men 1000m

Rank	Lane	Bib(s)	NF	Name(s)	250m	500m	750m	Time
1	2	235 248	POR	Emanuel SILVA João RIBEIRO	00:48.05 (6)	01:38.80 (1) 00:50.74 (1)	02:30.37 (1) 00:51.57 (3)	03:20.796
2	5	18 19	AUS	Kenny WALLACE Lachlan TAME	00:47.09 (1)	01:39.78 (3) 00:52.68 (5)	02:32.86 (5) 00:53.08 (7)	03:20.956 00:00.160
3	6	21 17	AUS	Riley FITZSIMMONS Jordan WOOD	00:47.50 (3)	01:39.34 (2) 00:51.84 (2)	02:30.51 (2) 00:51.16 (1)	03:21.748 00:00.952
4	4	89 100	ESP	Gabriel CAMPO Rubén MILLÁN	00:47.38 (2)	01:39.85 (4) 00:52.47 (4)	02:32.09 (3) 00:52.23 (6)	03:23.124 00:02.328
5	7	66 69	CZE	Daniel HAVEL Jan ŠTERBA	00:47.97 (5)	01:41.23 (6) 00:53.25 (6)	02:32.99 (6) 00:51.75 (4)	03:23.356 00:02.560
6	3	285 284	UKR	Vitaliy TSURKAN Oleh KUKHARYK	00:47.81 (4)	01:40.21 (5) 00:52.40 (3)	02:32.36 (4) 00:52.14 (5)	03:24.292 00:03.496
7	1	274 275	SLO	Alan APOLLONIO Simon BLAZEVIC	00:49.70 (9)	01:43.95 (9) 00:54.24 (8)	02:35.45 (7) 00:51.50 (2)	03:26.812 00:06.016
8	8	132 134	GER	Felix LANDES Karl WEISE	00:48.45 (7)	01:42.24 (7) 00:53.79 (7)	02:36.08 (8) 00:53.83 (8)	03:28.092 00:07.296
9	9	98 94	ESP	Pedro VÁZQUEZ Juan GONZÁLEZ	00:48.91 (8)	01:43.29 (8) 00:54.38 (9)	02:37.19 (9) 00:53.90 (9)	03:29.164 00:08.368

Fig. 11.7b

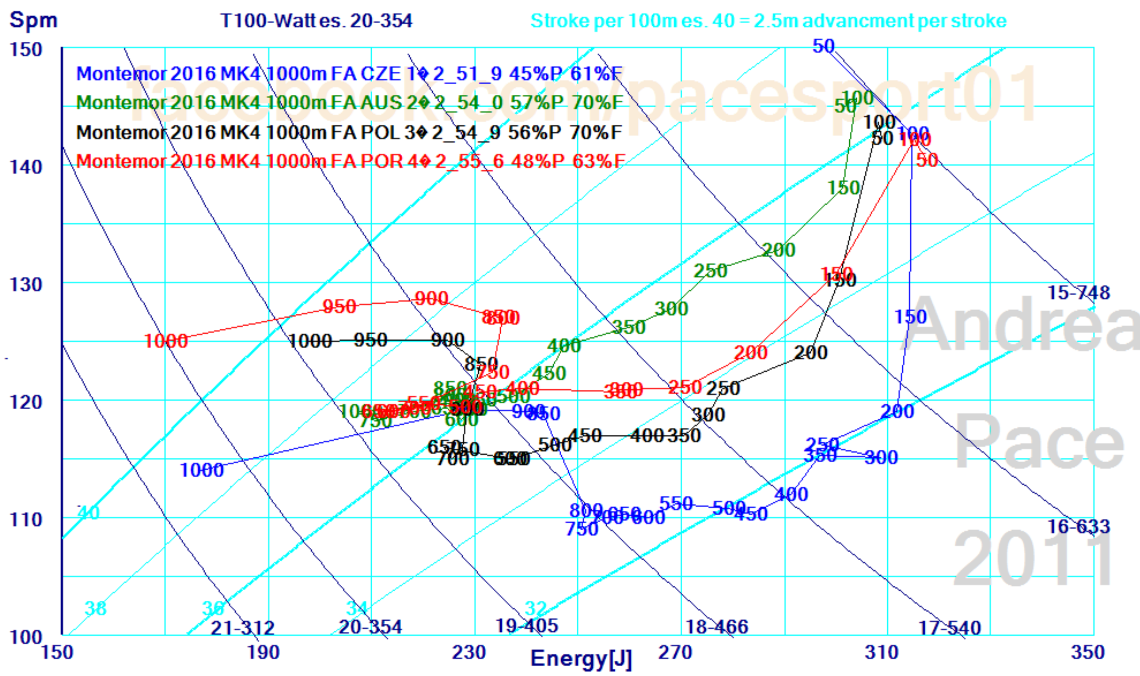

Fig. 11.8

05/06/2016 11:10					Race 84 Final A				K4 Sen Men 1000m
Rank	Lane	Bib(s)	NF		Name(s)	250m	500m	750m	Time
1	5	66 70 71 69	CZE		Daniel HAVEL / Josef DOSTÁL Lukáš TREFIL / Jan ŠTERBA	00:40.97 (2)	01:22.80 (1) 00:41.83 (1)		02:51.884
2	4	18 16 21 17	AUS		Kenny WALLACE / Jacob CLEAR Riley FITZSIMMONS / Jordan WOOD	00:40.58 (1)	01:23.22 (2) 00:42.64 (2)		02:53.980 00:02.096
3	7	199 209 193 203	POL		Martin BRZEZINSKI / Rafal ROSOLSKI Bartosz STABNO / Norbert KUCZYNSKI	00:41.34 (5)	01:24.14 (3) 00:42.79 (3)	02:09.55 (1) 00:45.41 (1)	02:54.900 00:03.016
4	3	240 235 248 230	POR		Fernando PIMENTA / Emanuel SILVA João RIBEIRO / David FERNANDES	00:41.24 (4)	01:25.02 (5) 00:43.78 (6)	02:10.71 (2) 00:45.68 (3)	02:55.556 00:03.672
5	8	115 108 107 111	FRA		Vincent LECRUBIER / Guillaume DECORCHEMONT Guillaume BURGER / Pierrick BAYLE	00:41.69 (6)	01:24.83 (4) 00:43.14 (5)	02:11.94 (4) 00:47.10 (5)	02:57.056 00:05.172
6	1	7 12 10 9	ARG		Daniel DAL BO / Pablo DE TORRES Juan CÁCERES / Gonzalo CARRERAS	00:42.39 (7)	01:25.50 (6) 00:43.10 (4)	02:11.13 (3) 00:45.63 (2)	02:57.400 00:05.516
7	2	92 99 98 94	ESP		Javier CABAÑÍN / Pelayo ROZA Pedro VÁZQUEZ / Juan GONZÁLEZ	00:42.40 (8)	01:27.43 (8) 00:45.03 (8)	02:13.37 (5) 00:45.93 (4)	02:58.368 00:06.484
8	6	132 138 131 134	GER		Felix LANDES / Tamas GECSÖ Felix KOENIG / Karl WEISE	00:41.20 (3)	01:25.75 (7) 00:44.55 (7)		03:04.216 00:12.332
9	9	254 238 231 227	POR		Pedro BONITO / Fábio CAMEIRA David VARELA / Bruno MOREIRA	00:43.53 (9)	01:28.89 (9) 00:45.36 (9)	02:17.37 (6) 00:48.48 (6)	03:05.540 00:13.656

Fig. 11.8b

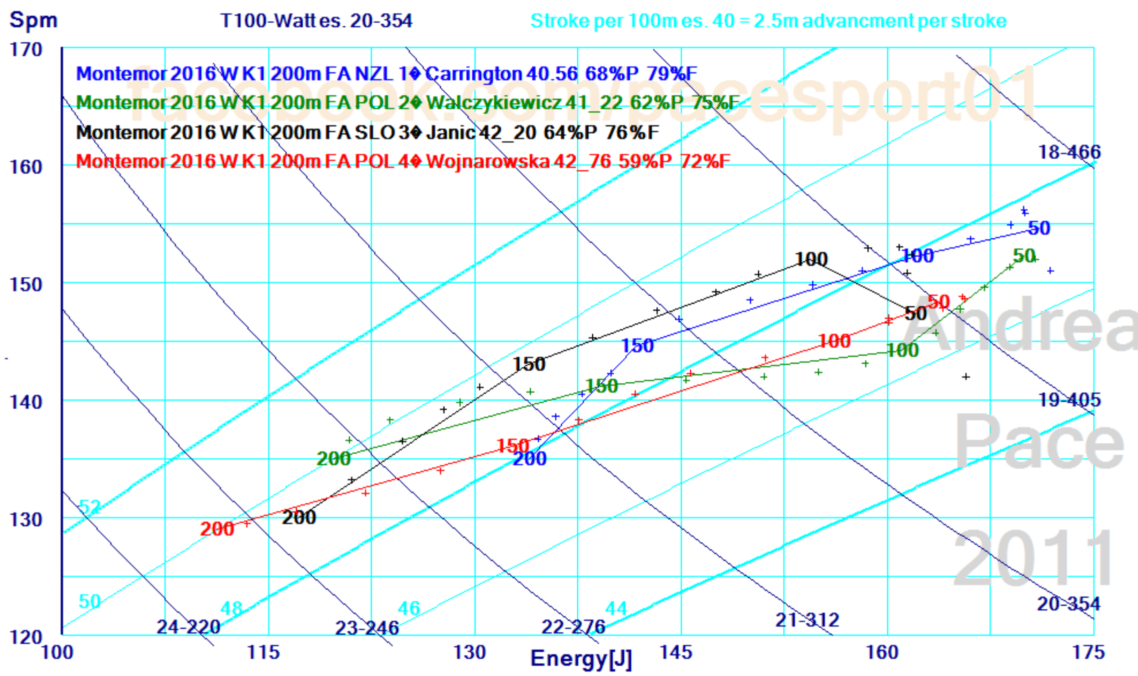

Fig. 11.9

04/06/2016	12:05		Race 38	Final A	K1 Sen Women 200m
Rank Lane	**Bib(s)**	**NF**	**Name(s)**		**Time**
1 6	180	NZL	Lisa CARRINGTON		00:40.556
2 5	190	POL	Marta WALCZYKIEWICZ		00:41.220 00:00.664
3 3	273	SLO	Spela JANIC		00:42.204 00:01.648
4 4	187	POL	Ewelina WOJNAROWSKA		00:42.764 00:02.208
5 1	24	CAN	Andreanne LANGLOIS		00:42.836 00:02.280
6 8	82	ESP	Sara OUZANDE		00:43.112 00:02.556
7 7	219	POR	Joana VASCONCELOS		00:43.348 00:02.792
8 2	22	AUT	Ana LEHACI		00:43.672 00:03.116
9 9	126	GER	Tabea MEDERT		00:44.752 00:04.196

Fig. 11.9b

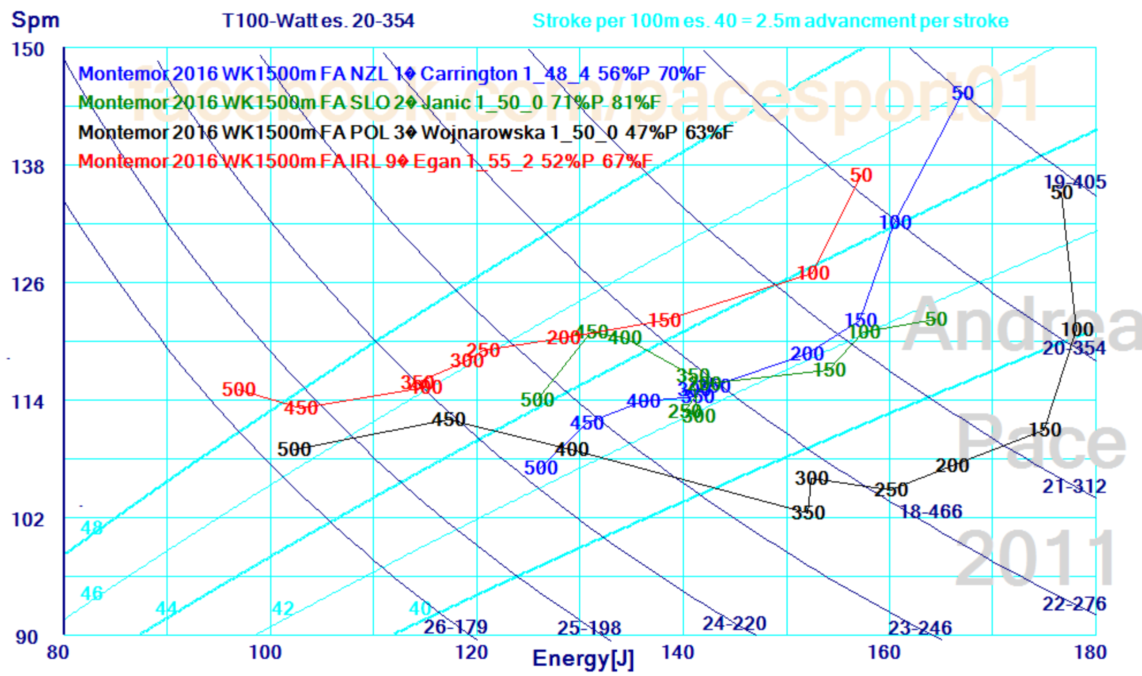

Fig. 11.10

05/06/2016	10:39			Race 80 Final A		K1 Sen Women 500m
Rank	Lane	Bib(s)	NF	Name(s)	250m	Time
1	5	180	NZL	Lisa CARRINGTON		01:48.364
2	9	273	SLO	Spela JANIC		01:49.992 00:01.628
3	4	187	POL	Ewelina WOJNAROWSKA		01:50.024 00:01.660
4	7	25	CAN	Emilie FOURNEL		01:50.192 00:01.828
5	6	182	POL	Anna PULAWSKA		01:51.024 00:02.660
6	8	27	CAN	Michelle RUSSELL		01:51.196 00:02.832
7	3	126	GER	Tabea MEDERT		01:51.964 00:03.600
8	2	22	AUT	Ana LEHACI		01:53.004 00:04.640
9	1	156	IRL	Jennifer EGAN		01:55.180 00:06.816

Fig. 11.10b