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TRENDS 2016

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Photo:

Cover photo: Horacio Llorens flying in front of the Northern Lights in January 2016.
Photo: Frode Sandbech/Red Bull Content Pool

CONTENTS

Translation by Ruth Jessop

PORTFOLIO
Horacio llorens polar paramotoring 3

NEWS
Paragliding World Cup 13
Las Candelas 21

TRENDS
Trends: the weight of wings 25
Stretch out! 28
Leading edge rods: a new trend from yesterday, evident today 34
Trends 2016 37
Stubaï Cup 61
The Swan project 75

TESTS
Niviuk Ikuma 23, 25 77
Skywalk Cayenne 5 S, XS 83
Niviuk Kougar 2 90
Ozone Roadster 2 96
Ozone Viper 3 102
Dudek Snake versus Snake XX 109
The exhibitors at the 2016 Thermik-messe trade show 123

HORACIO LLORENS
POLAR PARAMOTORING

Photo: Frode Sandbech/Red Bull Content Pool

An adventure trip to the north of Norway for Horacio Llorens, the paraglider acrobat who flies paramotors more and more now too...
Photo: Frode Sandbech/Red Bull Content Pool

An amazing project and a great success: capturing exceptional images with his illuminated paramotor, Horacio llorens danced in the sky in front of the northern lights.

Horacio Llorens on a reconnaissance flight with his Kangook Vikking chassis equipped with a Polini Thor 200 engine. The lighting system was attached to the cage. As Horacio flew 50% of the time over water, he wore a Kangook automatic lifejacket as well as a normal lifejacket.
The romantic cabin below served as the base camp for this expedition.

The team had to be ready every night to set off as soon as the Northern Lights appeared. A very slick operation: seven minutes after the 'lets go' signal, Horatio was in the air.

The site they chose was always in the lee of the mountain, thus requiring power. 'The combination of a robust Kangook Vikking chassis and a powerful Polini Thor 200 was perfect,' recounted Horacio.

In the lee of the mountain: a complicated take-off.
Photo: Frode Sandbech/Red Bull Content Pool

Photo: **Frode Sandbech/Red Bull Content Pool**

At last it all came together: the Northern Lights appeared and Horacio took off for his celestial dance. Tromsø, the eighth largest town in Norway, is north of the Arctic Circle.
Photo: Frode Sandbech/Red Bull Content Pool

The Northern Lights mainly occur in the regions near the magnetic poles, in a zone between 65° and 75° latitude.

The Northern Lights or Aurora Borealis are caused by the interaction between charged particles of the solar wind and the high atmosphere.

Mission accomplished: the photos were shown all over the world, including on mainstream television.

THE NORTHERN LIGHTS PROJECT

PARAGLIDING WORLD CUP

At the Super Final in Mexico in January 2016, the pilots who flew very tactically were able to take the advantage.

By Lucian Haas. Photos: Laura Sepet - laura@pwca.org

Stefan Wyss on his Ozone EnZo 2

Julien Wirtz on his Ozone EnZo 2

Swiss pilot Stephan Wyss's victory was well deserved. Out of the 8 valid tasks, he won 4 and was second and third in two others. He proved himself through surprising route choices, especially during the seventh and eighth task.

As far as the wings were concerned, the EnZo 2 monopolized the podiums, taking the first five places and fifteen out of the top twenty. The Gin Boomerang 10 is considered to be faster but couldn't make the most of this advantage in Mexico. On one hand the weather obliged the pilots to often fly in a more defensive fashion. On the other hand, the tasks often required good tactics and a judicious choice of route rather than speed. At the Super Final, the scoring system had been modified as well, in a way that rewarded, with 'Leading Points', judicious work at the front of the group rather than arriving fast.

Luca Donini on his Ozone EnZo 2

Seiko Fukuoka Naville (Ozone EnZo 2)

Laurie Genovese (Ozone EnZo 2)

Luc Armant on the victory podium: Ozone won the team classification.

Emanuelle Zufferey (Niviuk IcePeak 8)

Laurie Genovese, Seiko Fukuoka Naville and Emanuelle Zufferey

WOMEN'S RESULTS			
1	Seiko FUKUOKA NAVILLE	FRA	Ozone EnZo 2
2	Laurie GENOVESE	FRA	Ozone EnZo 2
3	Emanuelle ZUFFEREY	CHE	Niviuk IcePeak 8
4	Keiko HIRAKI	JPN	Ozone EnZo 2
5	Petra SLIVOVA	CZE	Gin Boomerang 10
6	Silvia BUZZI FERRARIS	ITA	Ozone EnZo 2
7	Klaudia BULGAKOW	POL	Ozone EnZo 2
8	Nao TAKADA	JPN	Ozone Mantra 6
9	Atsuko YAMASHITA	JPN	Ozone Mantra 6
10	Yael MARGELISCH	CHE	Niviuk Icepeak 7

Julien Wirtz, Stefan Wyss and Luca Donini

OVERALL RESULTS			
1	Stefan WYSS	CHE	Ozone EnZo 2
2	Julien WIRTZ	FRA	Ozone EnZo 2
3	Luca DONINI	ITA	Ozone EnZo 2
4	Alexandre JOFRESA	FRA	Ozone EnZo 2
5	Xevi BONET DALMAU	ESP	Ozone EnZo 2
6	Aaron DUROGATI	ITA	Gin Boomerang 10
7	Ulrich PRINZ	DEU	Ozone EnZo 2
8	Guy ANDERSON	GBR	Ozone EnZo 2
9	Jean Marc CARON	FRA	Niviuk Icepeak 9
10	Christian BIASI	ITA	Ozone EnZo 2
11	Luc ARMANT	FRA	Ozone EnZo 2
12	Honorin HAMARD	FRA	Ozone EnZo 2
13	Lucas BERNARDIN	FRA	Niviuk IcePeak 8
14	Joachim OBERHAUSER	ITA	Ozone EnZo 2
15	Russell OGDEN	GBR	Ozone EnZo 2
16	Felix RODRIGUEZ FERNANDEZ	ESP	Ozone EnZo 2
17	Tim ROCHAS	FRA	Ozone EnZo 2
18	Torsten SIEGEL	DEU	Gin Boomerang 10
19	Adrian HACHEN	CHE	Gin Boomerang 10
20	Yoshiki KUREMOTO	JPN	Ozone EnZo 2

Photo: Sascha Burkhardt

THE ENZO 2 HAS DONE IT AGAIN!

WE ASKED DESIGNER LUC ARMANT SOME QUESTIONS

free.aero: Luc, the EnZo 2 has proved itself once again. What makes it win?

Luc Armant : *There are several reasons why it has won for the last two full seasons, including three Super Finals (killjoys managed to get the first one disqualified but it is still the same wing).*
1. A lot of the best pilots like it and buy it.
2. It's efficient in active conditions.
3. It communicates good feedback from the thermal and the air mass.
4. Good behaviour during an incident (for a good pilot).
In demanding conditions, with long into wind sections for example, the first fifteen or twenty wings in the task were all EnZo 2s.

The EnZo 2: the clear winner of the 2015 World Cup. Here with the victorious Seiko Fukuoka Naville at the controls. The SharkNose clearly visible on the wing. Remember, the EnZo 1 didn't have one. Amongst other things, the SharkNose makes the wing safer at the limits of the speed range. It was a very useful feature in the conditions at the Super Final in Mexico. Also clearly visible, the tension bands doubled at the front.
Photo: Laura Sepet/PWCA

free.aero: What technology is used? Apart from the SharkNose is there any other new technology? Does Ozone's SharkNose play an important role?

Luc Armant: *The SharkNose doesn't mean a great deal. It's just a certain shape and position of the air inlets, so it doesn't make sense to speak of it in terms of performance. The design of the profile and the arc are the most important things.*

With the air inlet on a SharkNose you have a compromise in the behaviour at low/high speed which you can't get with a profile with more conventional openings. This compromise is essential in competitions because you need both performance and manoeuvrability in thermals and particularly in a gaggle (low speed) and in fast transitions (top speed).

The EnZo 2's profile is different from that of its competitors, but the differences are rarely more than a centimetre. The curve of the profile is very fine and must match the position of the attachment points, particularly on a two liner and the manufacture must be precise and reliable. There are lots of plastic leading edge rods all in 6.6 nylon of different diameters depending on what is needed. The cells are narrow, the internal structure is reinforced and folds and distortions minimised.

Most of the tension bands on the E2 are in 26 mm wide polyester, doubled up at the front to take the double attachment points of the As. Overall, the EnZo 2 isn't as revolutionary as was the BBHPP, and then the R11. It is simply the result of our increasing know how in competition wings."

ZENO AND ENZO 3

It's worth noting that Ozone are working on the Zeno, it will be a 'calmer' version of the EnZo, placed between the M6 and the EnZo 2 (perhaps even the EnZo 3, which they have been working on without giving a launch date).

The Zeno is supposed to help some pilots make the transition easily into CCC, with a wing close to the Mantra 6.

ENZO 2 -TECHNICAL DATA				
Manufacturer : OZONE - Mail : team@flyozone.com Web : www.flyozone.com				
YEAR	2014	2014	2014	2014
SIZE	XS	S	M	L
CELLS	101	101	101	101
FLAT SURFACE AREA [m²]	20.3	22.0	23.7	25.7
PROJECTED SURFACE AREA [m²]	17.2	18.6	20.1	21.7
FLAT WINGSPAN [m]	12.4	12.9	13.4	13.9
PROJECTED WINGSPAN [m]	9.7	10.1	10.5	10.9
FLAT ASPECT RATIO	7.55	7.55	7.55	7.55
PROJECTED ASPECT RATIO	5.5	5.5	5.5	5.5
ROOT CHORD [m]	2.05	2.14	2.22	2.31
ALL UP WEIGHT [kg]	85-95	90-105	95-115	105-125
WEIGHT OF THE WING [kg]	5.7	5.9	6.1	6.3
CERTIFICATION	CCCC			
Material	30D et le Porcher Sport 27 g			


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Due to its octagonal shape, its oscillation and descent rate is reduced.

LAS CANDELAS

The opening paramotor event of the year, Las Candelas in January 2016, was a huge success, thanks to the near-perfect weather conditions and the international attention.

Photo: Karen Skinner

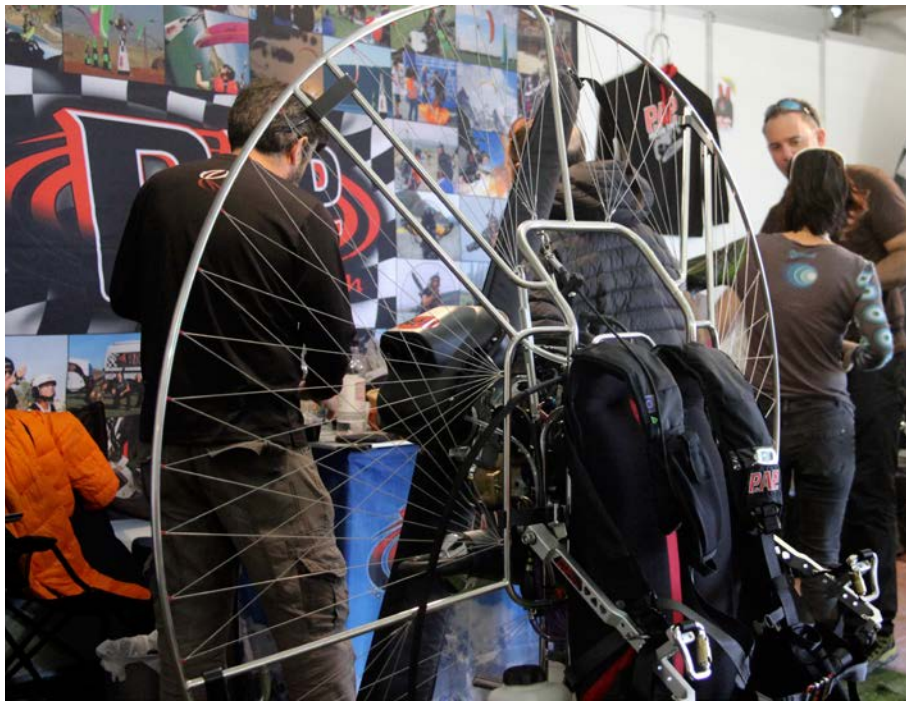
Photos Karen Skinner

The new folding trike. A new version of the SX single seat trike.

This year's Las Candelas was enjoyed by visitors from nearly a dozen countries including the United States and Argentina, with the biggest crowd to date. Energy levels were high as there was something for everyone to enjoy. Hundreds of visitors cheered as the skies filled with acro pilots, parachutists, trails of smoke, ribbons and the world's first digitally printed wings. Many of Spain's top pilots were also there: The Malaguita brothers with their never ending acro shows, with David the youngest of the three wooing the crowd below as he jumped from a trike.

AIRFER. - The new ppg EOS 100 titanium frame weighing 19.5 kg.

PAP. The new racing frames which are more aerodynamic. In the future they will be launching a 9 l fuel tank. All their machines have the new nylon gas throttle with the cruise wheel and a lighter exterior cover. Adjustments to the arms where they are fastened to the main frame mean that it can now withstand more pressure for acro manoeuvres.



Ramon Morrilas and Nicolas Aubert taking it in turns to fill the sky with their acro manoeuvres as they dragged a 100 metre long ribbon behind them. Paramania set up their water pylon on the lake for pilots to enjoy all weekend, and others laid out a line of bottles for some foot dragging fun. Gorgeous sunsets and nightly bonfires all over the camping area soon attracted some live music and fire-dancing under the star-filled sky.

Photos: Karen Skinner

NIVIUK
Tandem trike wing, work is in progress. A new range of colours has just been launched for the Link, Sapphire, Monarca and Kaki.

The fancy dress contest with a prize of €400 was won by multiple world record holder Karen Skinner dressed as a Minion, who flew the new PAP Thor 80 with the Link from Niviuk.

PARAMANIA. New wings: the Revo 3 and the Rokit trike wing which comes in a small size with lots of lift.

Photos: Kristianna May

Despite their increasingly sophisticated design, even certain very high performance wings like this Niviuk Artik 4 P can be 'as light as a feather': 3.8 kg in size 23...

TRENDS: THE WEIGHT OF WINGS

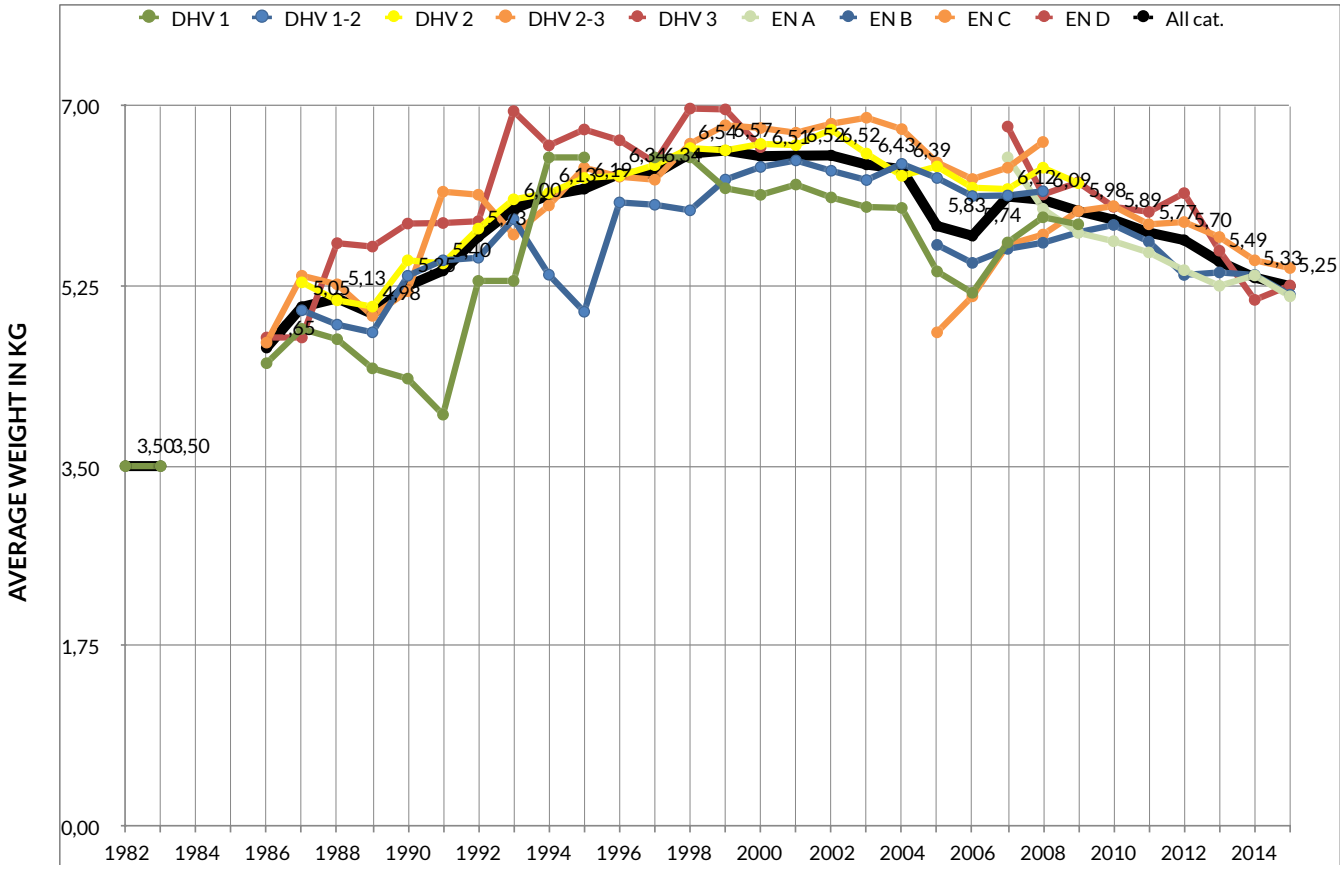
A trend which is hardly surprising and confirmed by the statistics: the weight of paragliders is decreasing more and more, and it's happening across all the categories...

Magnus Auvinen, who calculated the statistics on aspect ratios (see page 30), has also analysed the trends concerning the weight of our wings since paragliding began.

The result is hardly surprising: the weight of wings increased a lot in the 1990s. Paragliders became more and more sophisticated, whilst the manufacturers weren't at all worried about the resulting weight.

It didn't matter if a solo wing weighed about 7 kg.

EVOLUTION OF THE AVERAGE WEIGHT OF PARAGLIDERS (BY MAGNUS AUVINEN)



N.B. it's the average weight in each category of wing certified (tandems excepted); some wings are a lot heavier than 7kg in the statistics.
In black, the average across all the categories.
On the other hand, the number of paragliders which came out in the new EN A-D classes was pretty low in the beginning and influenced the results in a disproportional manner: the only EN C in 2005 was the Huapi wing by Nervures, specialist and pioneer in 'Hike and Fly...'
In 2006, there was only Sky Paragliders (Atis) and Skyjam who had relatively lightweight wings certified.
From 2007 onwards, the other manufacturers went for the EN norm.

At the time, there was little talk of 'Hike and Fly' and we weren't really aware of the problems caused by weight on the behaviour of our wings.

There then followed a long period of reflection after 2000, followed by the first significant reduction in about 2005.

But the real 'hunt for the extra kilo' started in about 2010 with Hike and Fly, the great leveller, bringing the emphasis on design towards light weight, including for paramotor wings.

This trend continues, making the weights uniform across all the EN A-D categories. The EN C and D certified wings have gone on a serious diet and are approaching the EN A and B wings, bringing them very close to the average across all the classes put together, of 5.25 kg.

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The LiteSpeed is one of the most versatile wings in our range. It is equally comfortable in light or strong wind conditions and balances the high levels of efficiency necessary for soaring and thermalling flights with the speed, agility, and roll authority required for dynamic and rapid descent flights. The Litespeed features both a speed system and rear-riser trimmers, opening up a wide range of flying styles. This, combined with its portability, makes it the perfect travel companion. The LiteSpeed's weight and pack volume is incredibly low for a wing with this many cells, thanks to more than a decade of Ozone lightweight R&D. Available now in three sizes. Combine it with the OZO harness for a Wing+Harness+Pack combination starting at 2.6kg (5.7lbs). Contact your local Ozone dealer for more info.

WWW.FLYOZONE.COM

Marshall Miller and Matt Combs checking the winds before a flight in Jackson, Wyoming, USA. photo: **Loren Cox**

STRETCH OUT!

The Skyman Skyblade by Markus Gründhammer: this 2015 wing has a record aspect ratio of 13.56.

The aspect ratio is a determining factor for a wing's behaviour. We looked at the trends close up...

By Sascha Burkhardt and Magnus Auvinen (statistics)

The Skyman Deathblade by Markus Gründhammer: this 2012 wing has an aspect ratio of 13.01 for a wingspan of 18.5 metres. The length of the lines is also very substantial: 18 metres.

To understand the influence of a parameter, it can be very useful to exaggerate it to see what happens. As far as the aspect ratio is concerned, there is one pilot/manufacturer who loves the experience: Markus Gründhammer from the company Skyman.

Four years ago he brought out his experimental wing, the Deathblade, with a record aspect ratio of 13.01. In 2015 he brought out the Skyblade with an aspect ratio of 13.56. Both wings fly fairly well, but Markus prefers the Deathblade. Apparently it's the 0.5 extra which is too much. The wing is less easy to handle, and therefore less efficient in weak thermals, for example.

Whilst with the Deathblade, Marcus can do 'everything' from thermalling, to barrel rolls, to wingovers. Surprisingly, taking off is easier than he expected. He has to face the wing during inflation to be able to properly manage the rising wing, but that works well, even with a light back wind at take-off... In the air, the wing moves a lot, but Markus is used to that...

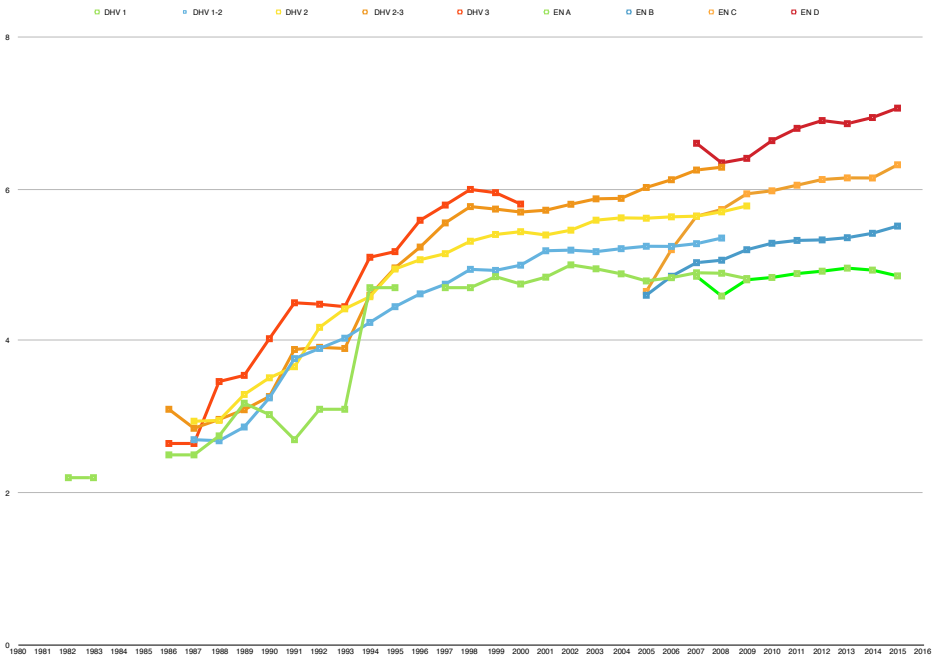
It is therefore interesting to see just how far, especially the Deathblade, remains useable despite its exceptional geometry. But one question needs to be asked: why increase the aspect ratio?

Remember, a larger aspect ratio normally increases a wing's performance because the induced drag decreases. The most striking examples are the aircraft with the best glide angle, sailplanes to be precise. They have a glide ratio of around 50-60 compared to about 10 for the current paragliders. This performance in glide comes from, amongst other things, the large aspect ratio which approaches 40 for some gliders. Imagine a paraglider which, when taking off at a thousand metres into calm air, could do 40 kilometres just by gliding...With paragliders, the manufacturers quickly took on board that increasing the aspect ratio increases the glide ratio.

At the beginning of the 1990s, on average, they exceeded 4. In 2000, the average for top of the range wings approached 6. It's worth bearing in mind that even a few tenths already make a difference.

In 2005, the average aspect ratio of the DHV 2-3 wings passed 6 for the first time. Since last year, the average for the EN Ds has stretched to 7...

TRENDS IN THE FLAT ASPECT RATIOS OF CERTIFIED PARAGLIDERS



This diagram shows the average flat aspect ratios for all the paragliders with a DHV or EN label, excluding prototypes and non certified competition wings. It therefore reflects the market, and not isolated developments.
The continuing trend: increasing the aspect ratio in the B, C and D classes, less so in the As.

	DHV 1	DHV 1-2	DHV 2	DHV 2-3	DHV 3	EN A	EN B	EN C	EN D
1980									
1981									
1982	2,20								
1983	2,20								
1984									
1985									
1986	2,50			3,10	2,65				
1987	2,50	2,70	2,94	2,85	2,65				
1988	2,75	2,69	2,95	2,97	3,47				
1989	3,18	2,87	3,30	3,09	3,55				
1990	3,03	3,25	3,51	3,27	4,03				
1991	2,70	3,77	3,66	3,89	4,50				
1992	3,10	3,90	4,18	3,92	4,48				
1993	3,10	4,04	4,42	3,90	4,45				
1994	4,70	4,24	4,58	4,60	5,10				
1995	4,70	4,45	4,95	4,96	5,17				
1996		4,62	5,07	5,23	5,59				
1997	4,70	4,75	5,15	5,55	5,79				
1998	4,70	4,94	5,31	5,77	5,99				
1999	4,85	4,93	5,40	5,73	5,95				
2000	4,75	5,00	5,44	5,70	5,80				
2001	4,84	5,19	5,39	5,72					
2002	5,00	5,19	5,46	5,80					
2003	4,95	5,17	5,59	5,87					
2004	4,88	5,21	5,62	5,88					
2005	4,79	5,24	5,61	6,02			4,60	4,65	
2006	4,83	5,24	5,63	6,12			4,85	5,20	
2007	4,90	5,28	5,64	6,25		4,85	5,03	5,64	6,60
2008	4,89	5,35	5,70	6,29		4,59	5,06	5,73	6,34
2009	4,82		5,78			4,80	5,20	5,93	6,40
2010						4,83	5,28	5,97	6,63
2011						4,89	5,32	6,05	6,80
2012						4,92	5,33	6,12	6,90
2013						4,96	5,36	6,14	6,86
2014						4,93	5,42	6,14	6,94
2015						4,86	5,51	6,32	7,06

Magnus Auvinen is a 33 year old Swedish pilot and professional programmer. He discovered paragliding in 2012 in the Dolomites. Over a year ago he had already used the excellent data base www.para2000.org by Gérard Florit, which gathers together technical data about every paraglider wing from the start, to analyse the evolution of aspect ratio. For free.aero he brought the figures up to date and refined them.

But where's the limit? For pilots who are mere mortals, it's clear that increasing the aspect ratio makes handling the wing more difficult, especially when doing manoeuvres at the limit or outwith normal flight. Managing collapses is more difficult, and there is an increased risk of cravats. Careful though: the aspect ratio isn't the only criteria. Cédric Nieddu reminds us that, two years ago, Air Design's Rise, with an aspect ratio of 5.7, wasn't as difficult to manage during flying incidents as the Chili 3 with an aspect ratio of 5.5. But overall, pilots can be guided by the equation: the greater the aspect ratio, the greater the experience required.

On the other hand, an increase in the aspect ratio brings other disadvantages which can reduce the gain in performance. On this subject, David Dagault from Ozone explained to us, "the aspect ratio isn't the only parametre which determines the wing's performance. For performance, pure and theoretical, we also need to look at the flattening coefficient (the amount of arc), and the drag on the lines and on the wing. But if we stretch it out we lose cohesion. Therefore we need to increase the length of the line cone and/or increase the arc, in short, two elements which can have a negative effect overall.

When lengthening it, more cells need to be added, risking the loss of even more cohesion in the wing. Adding more cells means adding more lines and therefore creating more line drag. Once again, there is no guarantee that the result will be positive.

And we still haven't looked at the 'real' performance or, for example, the fact that a wing which is more stretched risks turning less well, and will have more movement from distortion of the wingspan, which will make it less efficient in thermals in difficult conditions. Or indeed a wing which is over trimmed to get through the tests in a category which it shouldn't be in.

In conclusion, theoretically, the greater the aspect ratio the greater the performance, but this isn't true all the time, therefore there is an optimum amount..." It's worth clarifying that, in these comparisons, it is the flat aspect ratio which counts the most.

The 2012 Skyman Deathblade remains one of Markus's favourite wings. He uses it regularly...

Of course the projected aspect ratio can be reduced by increasing the arc of the wing, this is being done more and more since the arrival of high arc wings.

Thus by increasing the curve, according to David Dagault, you can improve the reaction during an asymmetric collapse compared to a wing which has an identical flat aspect ratio, but which is flatter. The handling also improves and the cohesion, but the performance drops. The wing will also be more unstable in a spiral. Despite its better behaviour during an asymmetric collapse, it could, on the other hand, be more likely to cravat. As always, it's all a question of compromise.

CONCLUSION

Theoretically, increasing the aspect ratio certainly still hasn't reached its peak. But for the manufacturers to continue development in this direction, new techniques will eventually need to be found for making wings with better cohesion across the whole wingspan. In fact the RAST system presented by Michael Nesler at the Thermikmesse trade show (see article in this issue) is an example which could go in this direction. Michael estimates that the aspect ratio could thus be improved by 1. That would be massive.

Markus Gründhammer also knows how to 'take it easy': here's a photomontage that he took himself, where he shows one of his mountain wings with a more than reasonable aspect ratio.

Photo&Montage: Markus Gründhammer

LEADING EDGE RODS: A NEW TREND FROM YESTERDAY, EVIDENT TODAY

Past trends have made a reappearance: for example, leading edge rods ...

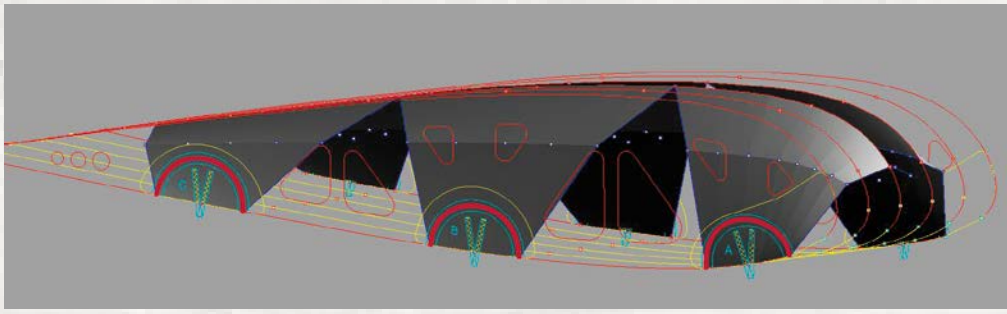
In the beginning, manufacturers used mainly Mylar or other hard films on the cell walls at the nose of the profile. Disadvantages: Mylars are sensitive to folding and heavy!

About ten years ago, manufacturers looked for ways to make paragliders more rigid for two reasons:

- To better scoop the air and thus improve the inflation, by making the leading edge more rigid.
- To increase the performance by reducing the number of lines.

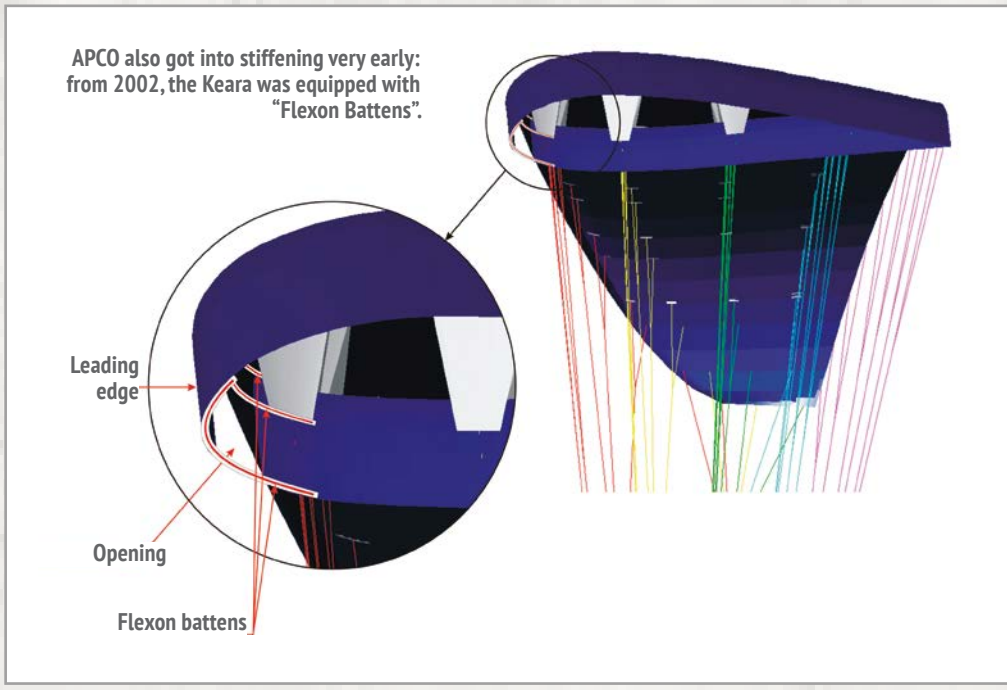
If you could get rid of all the lines on a wing, you would improve the glide ratio by at least two. If our paragliders were carved from a block of hard plastic, two rows of lines would be enough: one at the front and one at the back. For the manufacturer, this therefore means making the wing as rigid as possible, especially the cells, in order to get as near as possible to the ideal of a 'mono block' paraglider. The 'Gibus Arch' is a plastic rod fixed in a semicircle around the attachment point of a line.

They spread the forces more uniformly over the cell wall. This technique allowed Hervé Cobon ("Gibus "), the former wing designer at AirCross to make the U3 competition wing with only three rows of lines in 2002. Later, the prototype BBHPP from Ozone, the forerunner to the EnZo, also used the Gibus Arch principle.



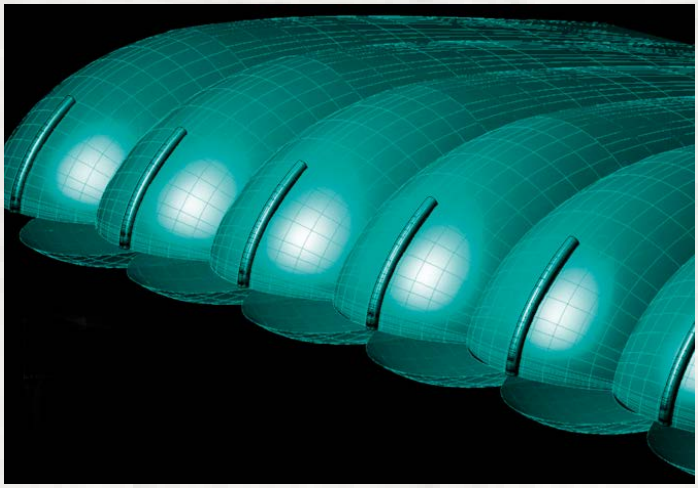
RODS IN MASS PRODUCED WINGS

But rods weren't something new and unheard of: the German engineer Fritz Dolezalek registered a patent in 1986: '*A slope paraglider corresponding to this patent is equipped with flat stiffeners or rods in the nose of the profile*'. Thus the famous Mylar in the leading edge was born, but Fritz Dolezalek had already clearly christened their use. Manufacturers used mainly Mylar and between 1986 and 2006 had to give six euros to Fritz Dolezalek for each wing they sold. The disadvantage of Mylar is its sensitivity to folding, especially when packing the wing.



The Gibus Arch from the former designer at AirCross Hervé Corbon ("Gibus"), present in 2002 in the U3, has contributed to the development of leading edge rods.

Leading edge rods or plastic wires, similar to those in a strimmer, are replacing Mylar more and more, principally for weight reasons.



The GIN Rigifoil used plastic wires in the middle of the cells, just above the air inlets.

Another pioneer was Apco who used « Flexon Battens » in the leading edge. This type of rigid rod is much more efficient than Mylar, whilst at the same time being lighter. The manufacturer, Gin, applied for a patent in 2001 for Rigifoils. Contrary to the “Dolezalek” type of stiffener, these rods aren’t fixed onto the cells, but instead put in the middle of the cell walls on the upper surface, just above the openings on the leading edge.

This patent was used by lots of manufacturers, but today, very often, 3D Shaping is a better replacement for this technique.

No matter what, without the nylon rods (which have been replaced by the metal Nitinol on some modern wings, such as Niviuk for example), the modern SharkNoses wouldn’t have seen the light of day. The shape of the SharkNose relies for a large part on the stiffness gained by crossing two of these famous rods.

The SharkNose, from all the manufacturers and in all its forms, wouldn’t be possible without leading edge rods.

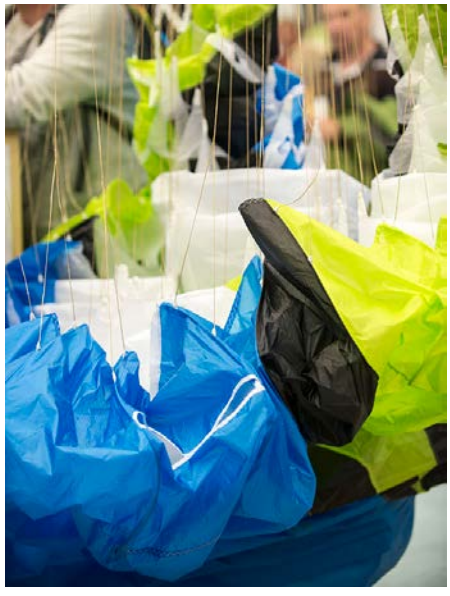
TRENDS 2016

At the end of February, the Thermikmesse trade show in Germany revealed, as it has done for nearly twenty years, all the trends in new gear for the coming season. Some of the new things presented on the following pages were officially unveiled for the occasion. Obviously our list isn't exhaustive; we'll publish more in future editions…

Saturday, the 27th of February 2016: The Thermikmesse trade show welcomed 3200 visitors who had come to see what's new for the coming season. There were 70 stands. Next year it will take place on the 18th of February 2017. (www.thermikmesse.de). Photo: Lucian Haas.

Photo: Lucian Haas

Photo: Lucian Haas



THERMIKMESSE 2016

This year the show was even more international. It was clearly visible that more manufacturers from more countries had come to show off their products here, near Stuttgart in Germany, far from the nearest paraglider or paramotor site. At the end of this article you'll find the list of all the manufacturers present in 2016 with links to their websites. Clearly visible too was the big increase in paramotoring: 'motorised thermalling' has become a method of propulsion which is being adopted by more and more pilots who were initially free flyers. Obviously one of the subjects discussed in the aisles at the show was the closure of the factories in the Kaesong Industrial Zone in North Korea.

A domino effect could bring small delays in delivery for most manufacturers, not just for lines but also for Porcher fabric impounded by Kim Jong Un, which will need to be replaced, this extra demand could reduce the number of products available.

Skywalk will, from now on, need to share it's production capacity at Qingdao in China with Gin. U-Turn are also currently moving their production. But given the stocks of wings made in advance by this manufacturer, the transition should go unnoticed.

Lucian Haas and Sascha Burkhardt

Photos: Sarah Fischer / Thermikmesse

U-TURN

U-Turn's range has been enhanced by the addition of several new models. On version 2 of their tandem, the 'Passenger', a SharkNose contributes to making it easier to launch.

There are two versions:
The GT weighing 7.3 kg and the PRO version weighing 8.3 kg.

U-TURN

The CrossRock is in the middle of the EN B classification.

The Eternity is in the middle of the EN A classification and weighs less than 4 kg in size SM. The Everest+ is their new ultra light wing. Despite its double surface, it only weighs 2.19 kg in size 19.

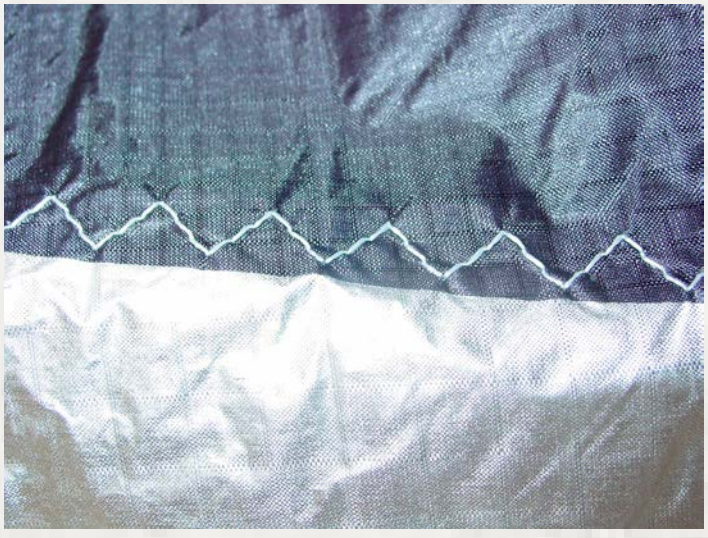
http://www.u-turn.de/web/english/home

YESTERDAY'S TRENDS
ALUMINISED FABRIC

Some past trends are no longer in vogue today. Either they weren't up to it technically, or they have been replaced by evolution. One example was the aluminised fabric, Aerofabrix, developed by Skywalk in collaboration with Porcher Sport.

After some convincing trials on the Flysurfer kites (owned by Skywalk), the Poison 2 was the first paraglider wing, in 2007, to use this fabric which incorporated a thin layer of aluminium deposited by vaporisation. It was a fabric with very low porosity, weighing only 29 g/m2. At the time, Skywalk were already boasting better behaviour in flying incidents for a lightweight wing. But most importantly, this fabric had ten times better resistance to aging, thanks to its reflection of UV.

Unfortunately, it was very, perhaps too, expensive to produce. With the improvements in ultra light classic fabrics, Skywalk finally chose the price/performance compromise of the latter...



SKYWALK

Skywalk are packing up. The new quick sack, the Easy Bag, only weighs 800 g and has a volume of 200 litres. For a neater packing there is a new version of the pack called the Magic Bag. It's lighter (470 grammes), 2.86 m long and 0.55 m wide. Their new wing, the Spice, is a Cayenne 5 lightened by about 25 %. Version 4 of the EN B top of the range Chili is coming out, along with the new version of the Poison, a wing based on the X-Alps 2, (CCC certified) which was designed for the X-Alps 2015 (which it did successfully). The Poison X-Alps will be EN D certified.
For more information:
www.skywalk.info

CHILI 4

SKYWALK

SPICE

SPICE- TECHNICAL DATA				
Manufacturer - Skywalk WEB : http://skywalk.info/fr/ Mail : info@skywalk.org Tel: +49 (0) 8641/69 48 40				
YEAR	2016	2016	2016	2016
SIZE	XXS	XS	S	M
CELLS	69	69	69	69
FLAT SURFACE AREA [m²]	21.52	22.68	24.10	26.07
PROJECTED SURFACE AREA [m²]	18.44	19.43	20.65	22.34
FLAT WINGSPAN [m]	11.75	12.06	12.43	12.93
PROJECTED WINGSPAN [m]	9.53	9.78	10.08	10.48
FLAT ASPECT RATIO	6.41	6.41	6.41	6.41
PROJECTED ASPECT RATIO	4.92	4.92	4.92	4.92
ALL UP WEIGHT [kg]	60-85	75-95	85-105	95-115
WEIGHT OF THE WING [kg]	3.9	4.1	4.3	4.5

POISON X-ALPS

POISON X-ALPS - TECHNICAL DATA			
Manufacturer - Skywalk - WEB : http://skywalk.info/fr/ Mail: info@skywalk.org Tel: +49 (0) 8641/69 48 40			
YEAR	2016	2016	2016
SIZE	XS	S	M
CELLS	80	80	80
FLAT SURFACE AREA [m²]	21.50	23	24.40
PROJECTED SURFACE AREA [m²]	18.54	19.83	21.04
FLAT WINGSPAN [m]	12.27	12.69	13.07
PROJECTED WINGSPAN [m]	10	10.35	10.66
FLAT ASPECT RATIO	7	7	7
PROJECTED ASPECT RATIO	5.40	5.40	5.40
ALL UP WEIGHT [kg]	65-90	85-105	95-115
WEIGHT OF THE WING [kg]	4	4.2	4.4

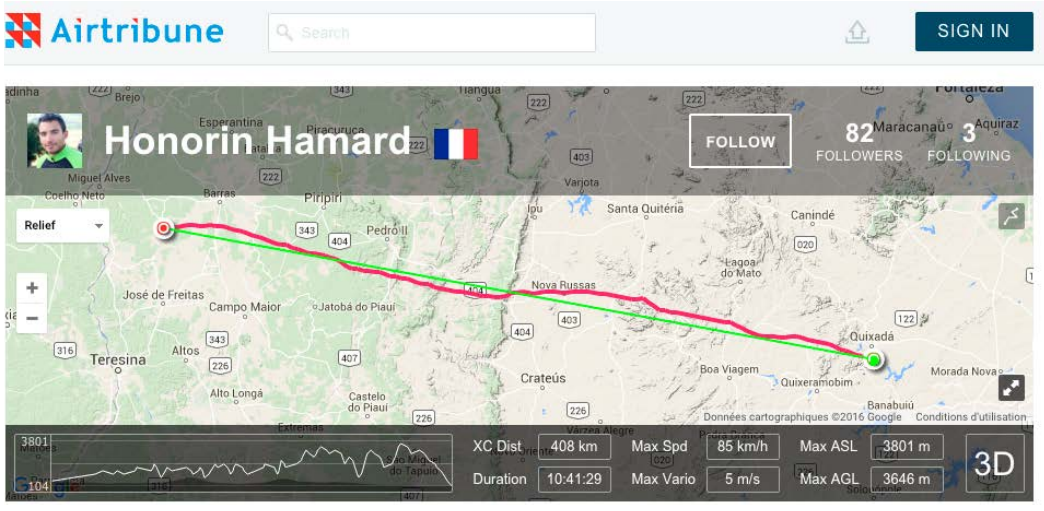
OZONE SWIFT MAX: WILL THE RECORD BREAKING TANDEM BE MASS PRODUCED?

In November 2015 Honorin Hamard shattered the tandem distance record, flying 407 km in Brazil with his passenger Karine Gras. The flight took eleven hours and was their third attempt at breaking the previous record of 363 km.

The tandem is an Ozone prototype partially based on the EN B Swift. This tandem, which is designed for flying distance (a vocation confirmed by this record), will start being mass produced this year. Contrary to the Swift, this tandem could eventually be EN C certified rather than EN B, thanks to the heavy wing loading and the presence of trimmers.

DELTA 3: EN D...
Other trends at Ozone for 2016: The Delta 3 will have roughly the same aspect ratio as the Delta 2.But it will be certified EN D (compared to EN C for the Delta 2), because it needs folding lines for thetest. Ozone are also working on a new square reserve parachute which will be called the Angel SQ. These reserves definitely have the wind in their sails.

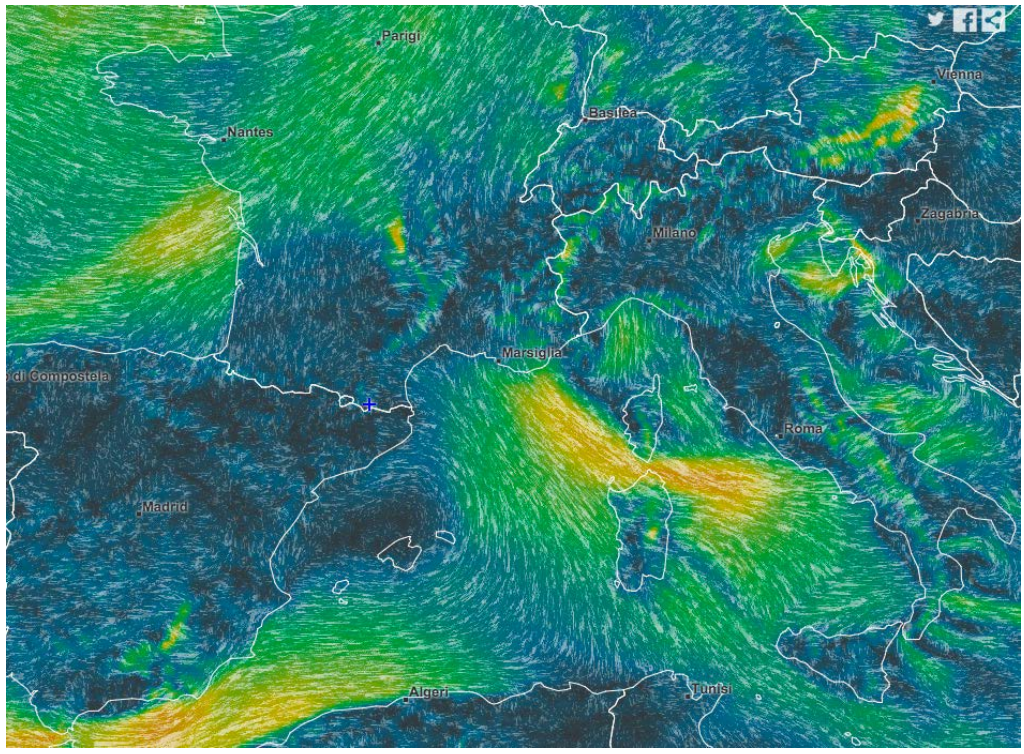
https://airtribune.com/honorinflywithme/tracks__16369

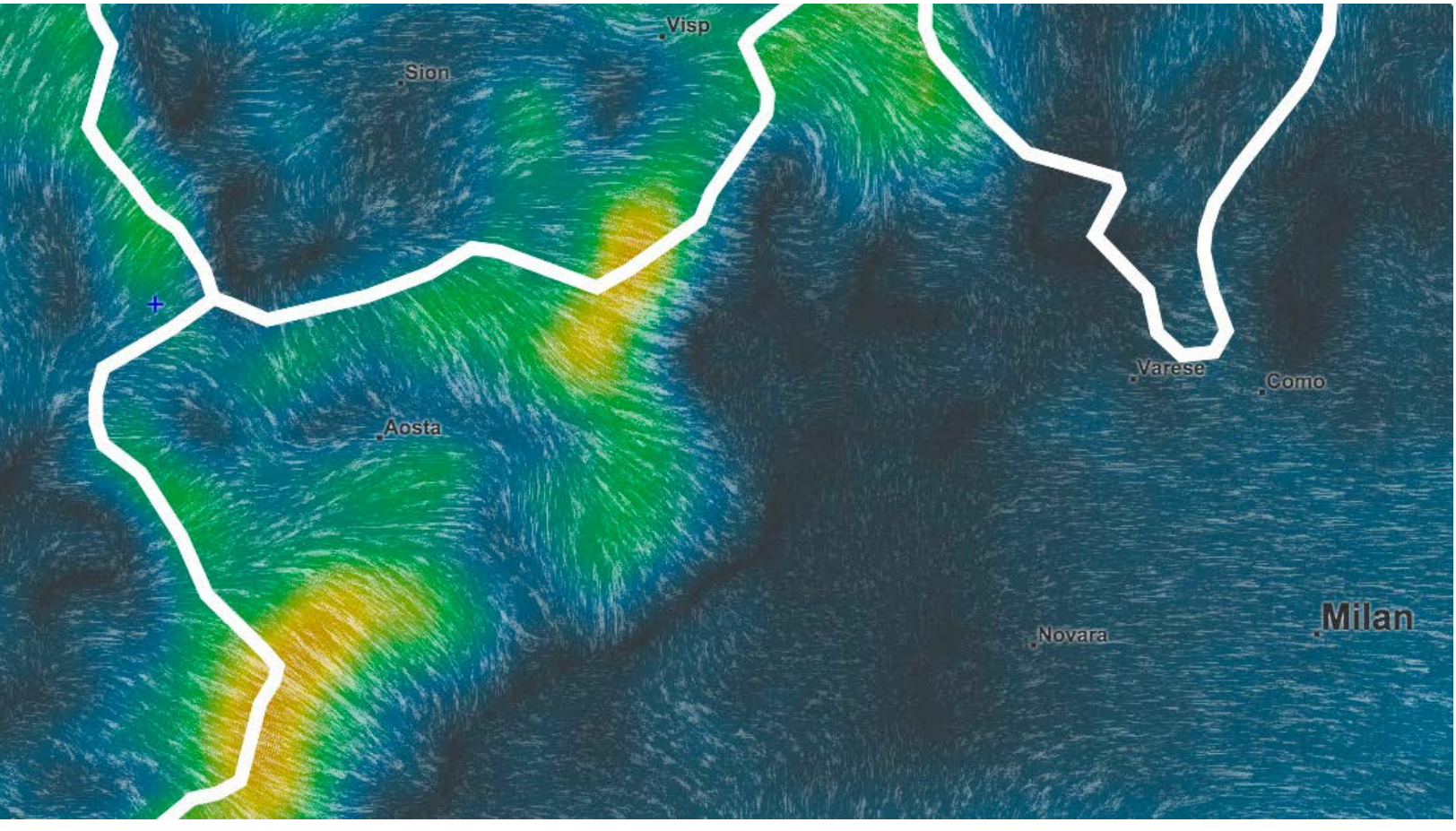


THE WIND PICKS UP AT METEOBLUE

Since February, Meteoblue have been offering yet another interesting presentation of the actual and forecast winds. On a map of Europe the currents are shown by a very clear and detailed animation. By zooming in you can see it's based on the NEMS (4 km resolution) model. A pilot can get a very good idea of the air flow around his site and the expected development. The animation is available for all heights, from ground level up to an altitude of 12 km.

www.meteoblue.com





INDEPENDENCE/SKYMAN

Yet another innovation which could have potential: the Zippy from Independence is an EN/LTF A wing with 'modern' performance which the pilot can deliberately downgrade before taking off by releasing airbrakes with the help of a zip. It then loses 2.5 points of glide and the sink rate will increase by 0.4 m/s. This is ideal for a beginner pilot being guided by radio, especially on approach.

There are other benefits: the wing will be more stable during a collapse and the stall point will be more obvious. Later, the pilot can take off without the airbrakes and enjoy the better performance. Available in four sizes for an all up weight of 55 kg - 130 kg.

The wing can also be ordered with paramotor risers.

INDEPENDENCE/SKYMAN

Photos Lucian HAas

Now Skyman are offering a packing tube with a very large opening. Also new: a child's harness EN/LTF certified in 2 sizes (height of child 80 – 110 cm and 90 – 135 cm). Price 280 €.

http://www.independence.aero

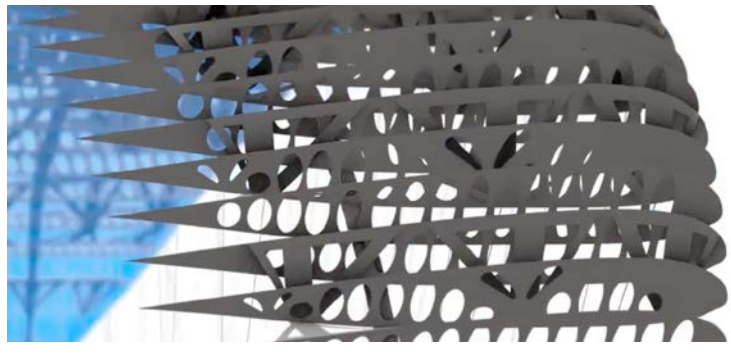
NOVA

We announced in our previous issue that the Ion 3 has been replaced by the Ion 4. The new version is a lot lighter than the old one. In S, the Ion 4 weighs 4.65 kg instead of 5.7 kg for its predecessor.This result is largely obtained by the internal structure being lightened. This means that there won't be a lightweight version of the Ion 4. The Ion 4 turns more easily than its predecessor, thanks to the wing tips being more slender.

ION 4 - TECHNICAL DATA

Manufacturer : NOVA Web : www.nova.eu Mail : info@nova.eu Tel : +43.5224.66026

YEAR	2016				
SIZE	XXS	XS	S	M	L
CELLS	49				
FLAT SURFACE AREA [m²]	22.06	24.31	26.69	29.12	31.71
PROJECTED SURFACE AREA [m²]	18.65	20.65	22.57	24.62	26.81
FLAT WINGSPAN [m]	10.65	11.21	11.72	12.24	12.78
PROJECTED WINGSPAN [m]	8.02	8.44	8.82	9.22	9.62
FLAT ASPECT RATIO	5.14				
PROJECTED ASPECT RATIO	3.44				
ROOT CHORD [m]	2.57	2.70	2.83	2.95	3.08
ALL UP WEIGHT [kg]	55-80	70-90	80-100	90-110	100-130
WEIGHT OF THE WING [kg]	4	4.3	4.7	5	5.3
CERTIFICATION	B				
MATERIAL	Upper surface: Dominico 20D. 35 g/m2 Dominico 20D. 35 g/m2				
PRICE [€]	3 400	3 400	3 400	3 400	3 400



NOVA

If the pilot wishes, he can order the Ion 4 with the new "Speedbrake Riser" system, a special riser which allows the pilot to fly using the Cs. Instead of having simple handles on the Cs, this system also controls the Bs to further reduce the impact of corrections on the performance of the wing. Initially the system was aimed mainly at the make's top of the range wings.

www.nova.eu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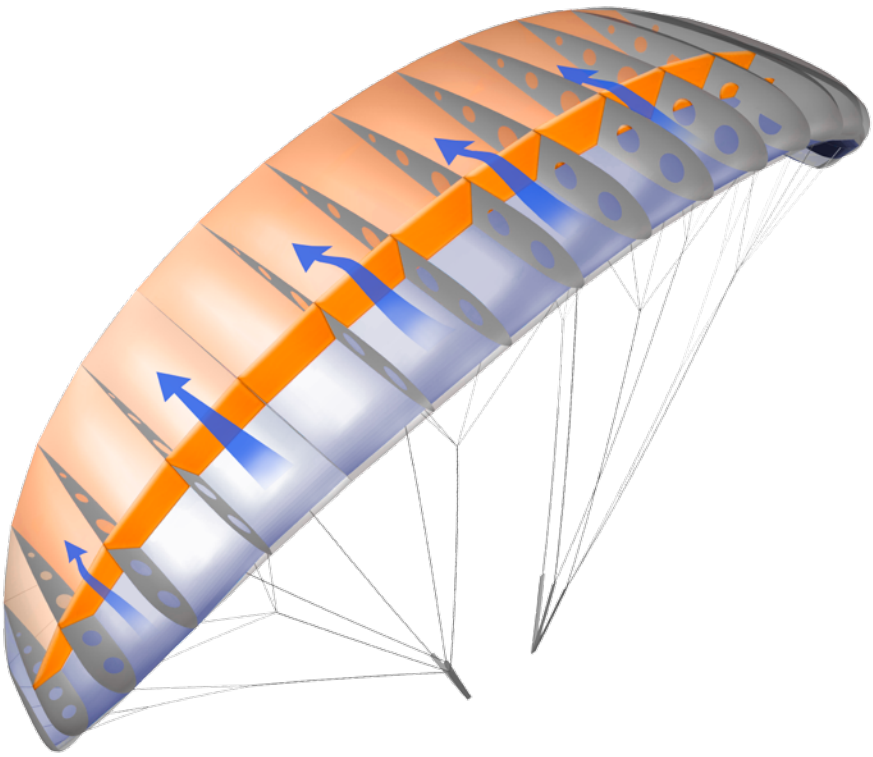
niviuk.com

TURBULENCE

The small French company which creates and prints its T-shirts in Annecy has just launched its new spring collection. You can see their designs for men, women and children on their website or at one of their stockists.

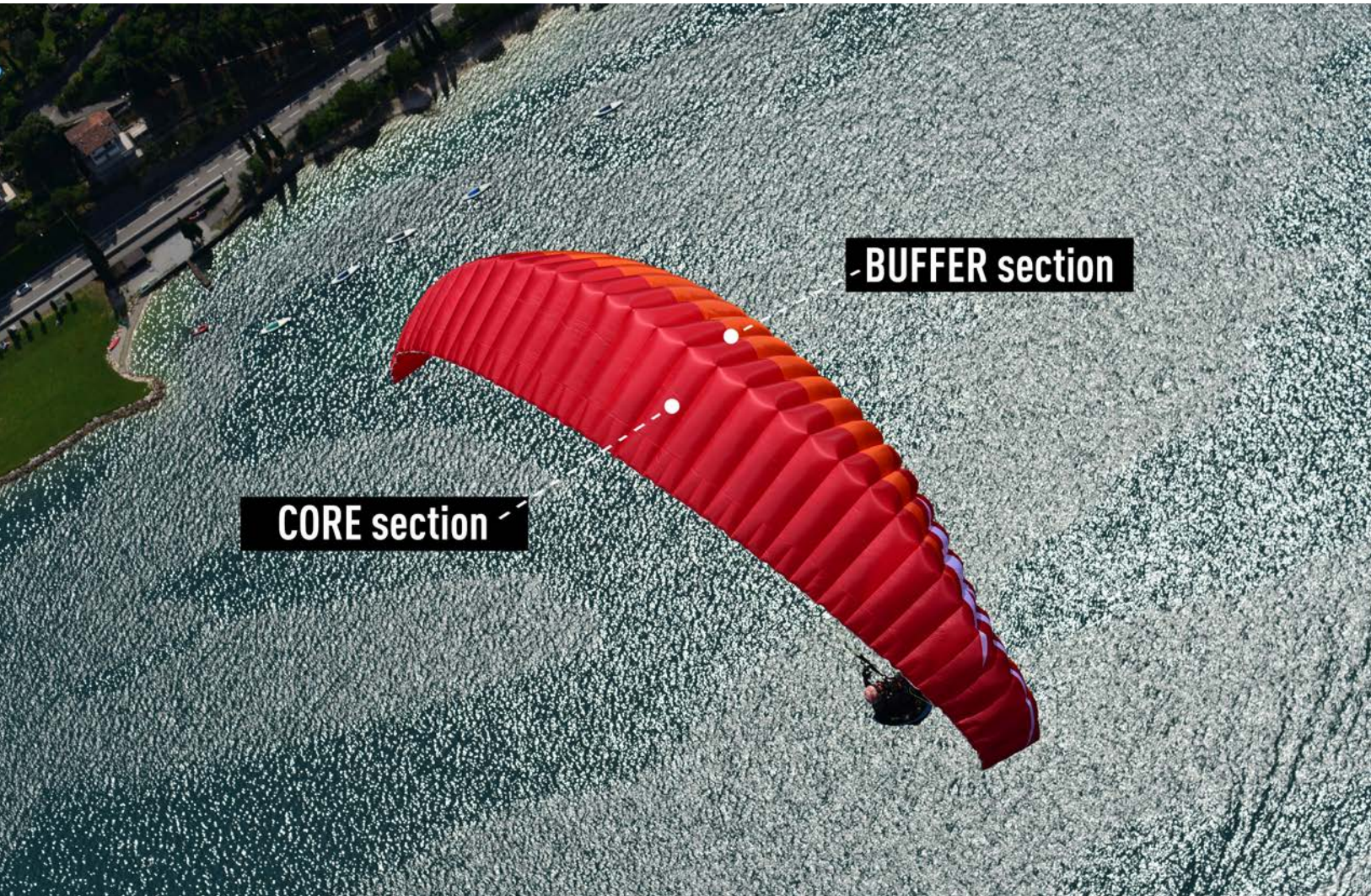
http://www.turbulence-shop.fr/

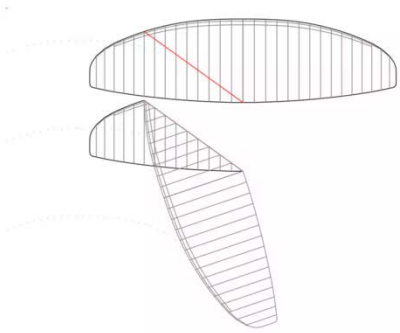


SWING RAST

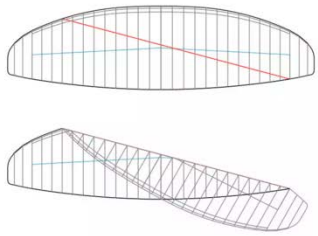
Swing presented their RAST system which we found promising: an inflatable fabric sausage which traverses the paraglider along the wingspan. With the help of valves, the manufacturer can define the parts which fill up later during inflation and which empty slower during a collapse.

Thus the back part of the wing becomes the 'Core Section', always well inflated and supported whilst the 'Buffer Section' at the front empties during a collapse.





A CLASSIC PARAGLIDER



A PARAGLIDER WITH RAST

This system is supposed to, amongst other things:

- Favour inflation as a priority in the front part of the wing, giving a more even inflation.
- Stops the wing over-flying during inflation
- Calm collapses by favouring smaller collapses.
- Reduce the loss of altitude after a collapse.
- Reduce the tendency to go into a spiral after a collapse.
- Reduce the dive after a collapse or a stall.
- Guarantee better cohesion in the wing in other extreme manoeuvres.
- Allows the aspect ratio to be increased

This innovation, developed by Michaël Nesler, is used in the new Mito wing (EN A), as well as in the new tandem, the Twin RS, expected out this spring. The latter will particularly benefit from the system during take off.

Whilst testing the Mito (EN A) the designer also made a secondary discovery. During load tests at 20 G (exceeding 18000 kg) the Mito S didn't explode, as any other wing would have done. The sausage apparently helps keep cohesion and resistance, by spreading out the extra load over time. We'll be keeping a close eye on developments!

The Mito with an 18000 kg load.

SWING ARUS

Swing are working on an airbag system which will go off automatically when the reserve opens. A good idea but we're doubtful about the commercial success. It implies the purchase of the whole system of harness and reserve (the Arus contains two). It costs about 3000 € but the excellent airbag only comes out if the reserve opens, and not when you hit the hill at takeoff for example.

Nevertheless the project needs to be kept an eye on.
Photos: Lucian Haas

http://www.swing.de

https://www.youtube.com/watch?v=LmA9w0iYkds&feature=youtu.be

ION 4 – Performance for All

High performance, light and a master at turning: the ION 4 has a better glide than the MENTOR 3. From 3.95 kg (XXS) it is feather light and thanks to its smart brakes, it offers impressive handling and climb performance. Discover the new milestone in the ION series!

Adventure intermediate with smart brakes (EN/LTF B)

www.nova.eu/ion-4

NOVA

COUPE ICARE

A date to note already: the 43rd Coupe Icare will take place from the 22nd to the 25th of September 2016 at Saint-Hilaire-du Touvet and Lumbin, in the heart of the Isère/Dauphiné area of France.

http://www.coupe-icare.org/

ADVANCE

On more and more models, the Swiss manufacturer is using a clever system for the diagonals inside the wing, including on the new Pi2. Instead of cutting a triangle in the end of the fabric, the diagonals are made up of several bands, cut in the sense of the warp of the fabric. The advantage: the fabric is under strain in the direction where it is the most resistant to distortion and it saves weight. The technique was inherited from the Omega X-Alps.

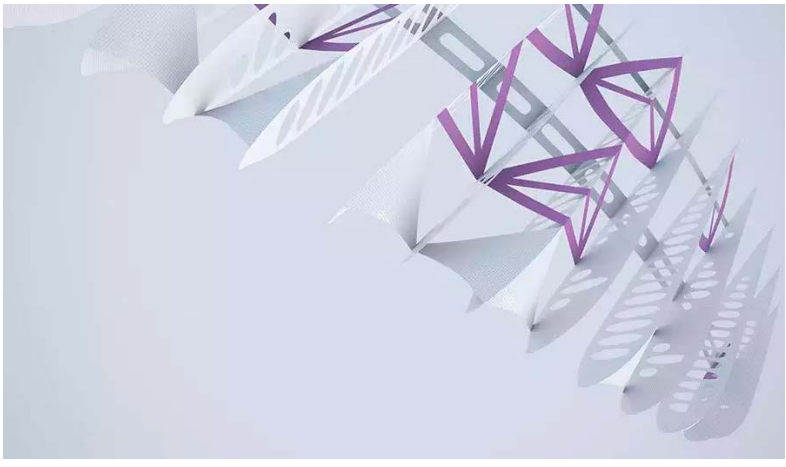
www.advance.ch

The new reserve, the Companion SQR ("Square Round") is supposed to combine a round parachute with a square one. Advance promise it opens very quickly and has lots of pendular stability. It's lightweight despite its robust material and is quick and easy to fold.

The reserve manufacturer "Companion Rescue Systems" has developed from a partnership between Evotec and Advance. In the team there are amongst others: Hannes Papesh, Peter Mack and Mike Küng.

Size/weight: 100 (1.25 kg) and 120 (1.35 kg). Certified EN/LTF.

www.companion.aero



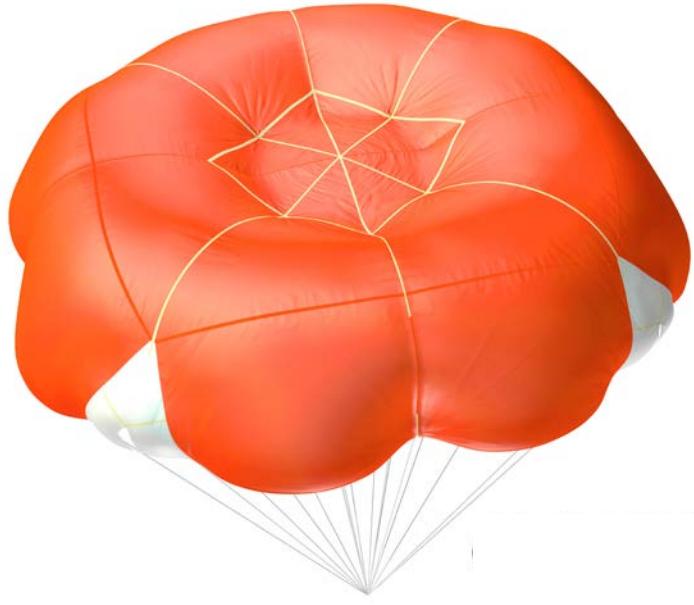


Photo Lucian Haas

GIN

We've already introduced virtually everything new at Gin in our previous edition of Free.Aero (Light). At the Thermikmesse trade show, the Genie Lite harness was warmly received by the visitors.

In the pipeline: The Sprint 3, an EN B semi lightweight wing with an aspect ratio of 5.6.

www.gingliders.com

NIVIUK'S NEW JACKETS:

On the outside they are windproof and made from 100% ultra light nylon; on the inside they are 90% down. They are light, compact and come with a hood.

The Down Jacket has sleeves with an opening for the thumb as well as a system for attaching to trousers to give extra comfort to pilots who need to move about. Made in green and in black.

For more information:
www.niviuk.com

Niviuk are working on a new tandem for a paramotor trike in two sizes with a maximum all up weight for the largest one of 390 kg. According to Niviuk, this is the largest that can be certified given the power available in the vehicles in the certification laboratories.

APCO

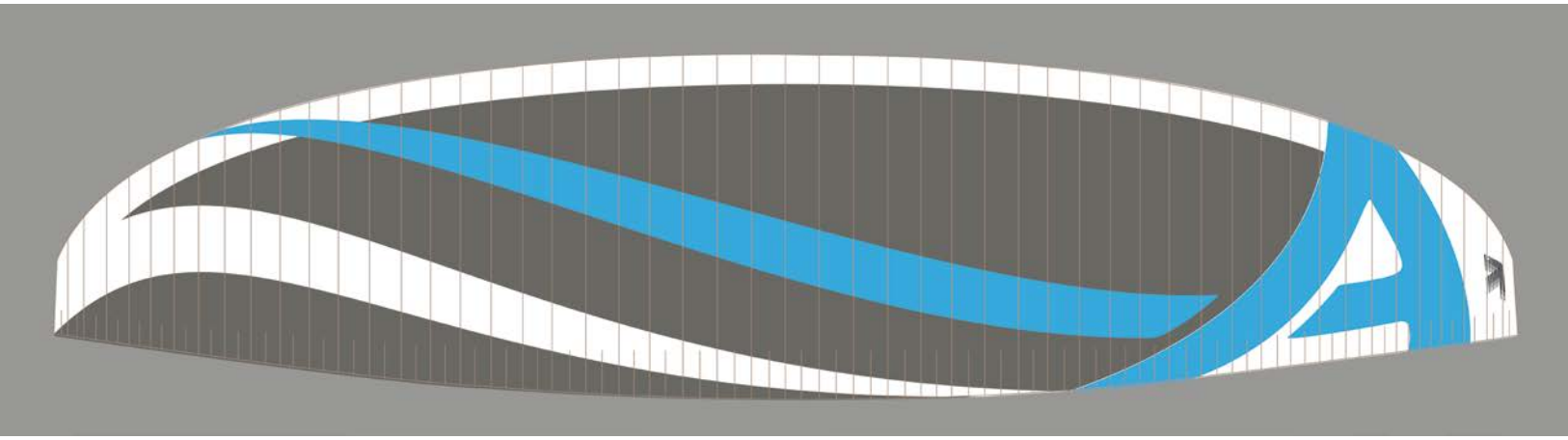
At Apco, the paramotor wing, the Lift EZ, has now been DGAC certified in all three sizes.

The new tandem, the Game 42, is finally available. It has a SharkNose to guarantee good cohesion even at low speeds. Its behaviour during inflation and take off is also very safe and comfortable, even with 'difficult' passengers.

Another advantage of the SharkNose is the small amount of effort required for the controls. On a tandem that's even more important.

A new lightweight harness is underway and the design aesthetics of the wings has been enhanced by a suggestion made by Kobi Yasha Gurevic during a competition.
In the meantime, they are waiting for DGAC paramotor certification of version 2 of the Force.

www.apcoaviation.com

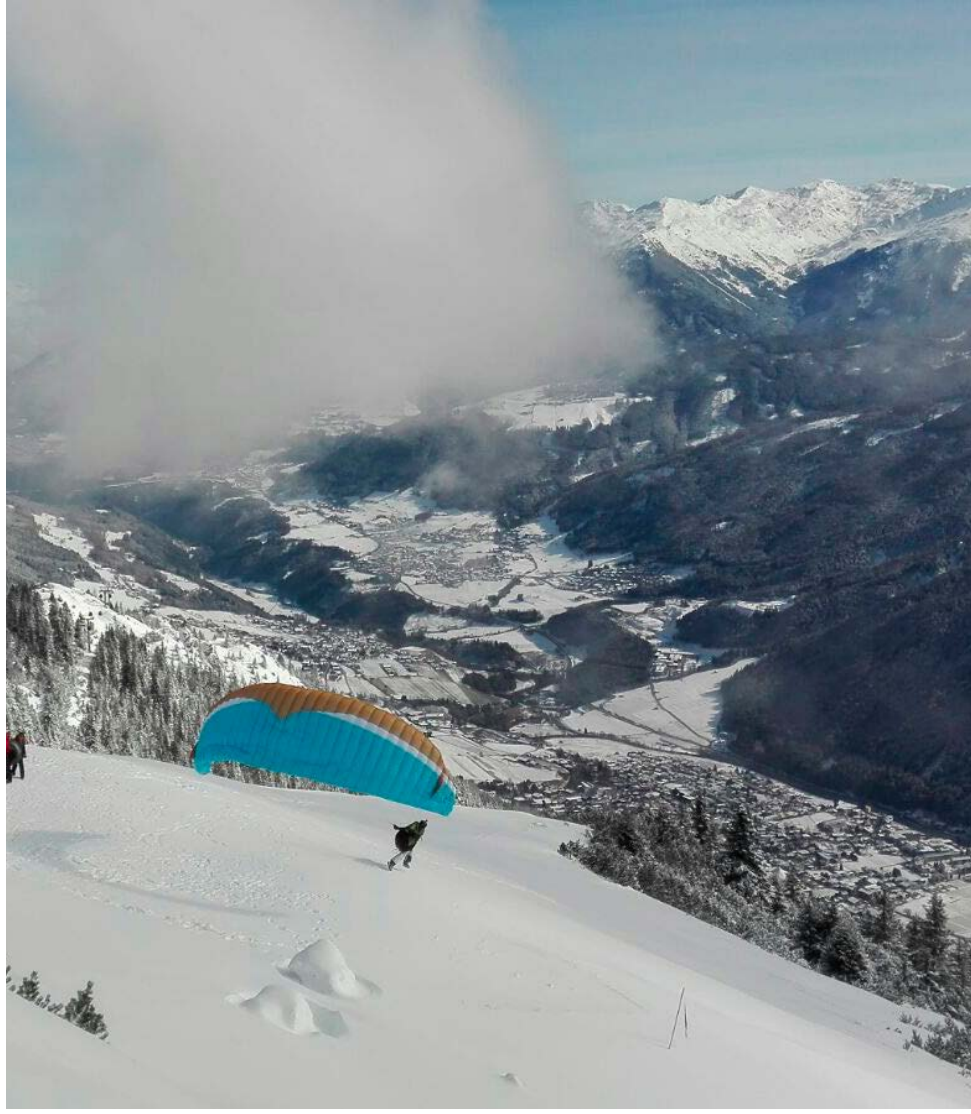


STUBAICUP

MARCH 4-6 2016

The Stubai Cup – Celebrating a Quarter Century. The Stubai Cup was founded by Hans Peter Eller of the Flugschule Parafly in 1988. For the past 10 years the event has been a memorial to his amazing vision and love of paragliding. Every year sees more and more pilots taking part in this wonderful flying experience. For the Stubai Cup 25th anniversary event many pilots from all over Europe and beyond came to the Stubaital to test fly new wings from 27 manufacturers.

The three day long Testival from the 4th -6th of March 2016, saw a mix of weather, from blue skies to light snowfall in beautiful Stubai, the "living room" of the paragliding scene. As usual, flight- shows, exhibits, paragliding stars, food and great music made for a party atmosphere.



Hosted by local paragliding school Parafly the site is a perfect spot for testing gliders. Two launch sites were prepared at the top of the Elferbahn in Neustift and the Schlick 2000 in Fulpmes.

"Retro" was the motto for the 25th anniversary cup, and saw paragliders and equipment from past decades. Neon colors, perms, mustaches and mullets all added to the fun look back at the history of paragliding.

Next year the Stubai Cup will take place from the 10th -12th of March 2017!

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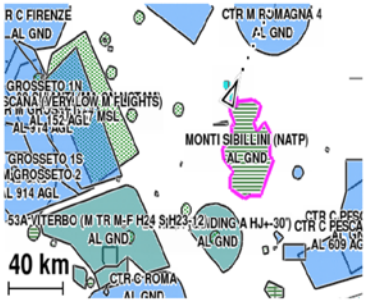

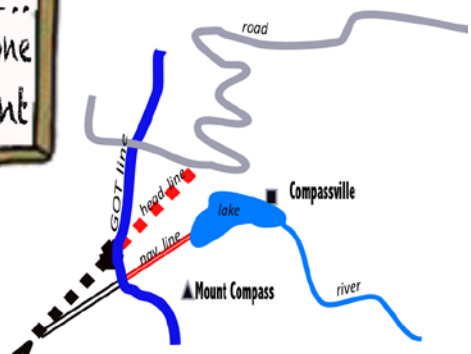

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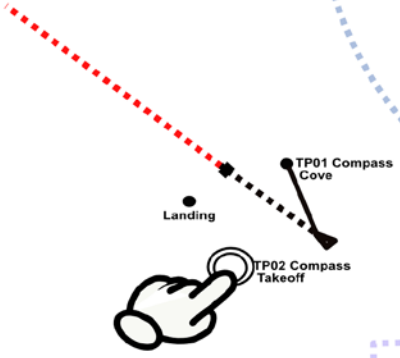
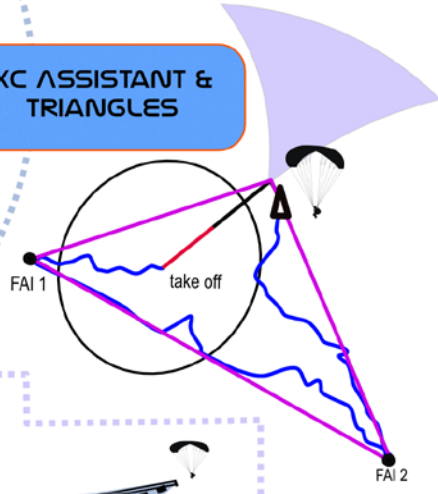
NEW HARD GLASS

NAVIGATION BY TOUCH

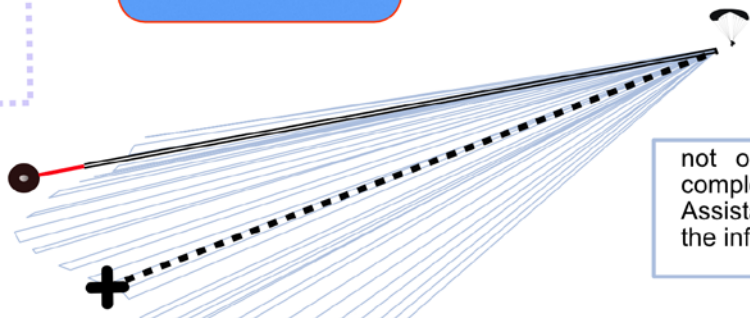
XC ASSISTANT & TRIANGLES





GLIDE OVER TERRAIN

choose a "goto" by a simple touch in the map. Move and zoom the maps



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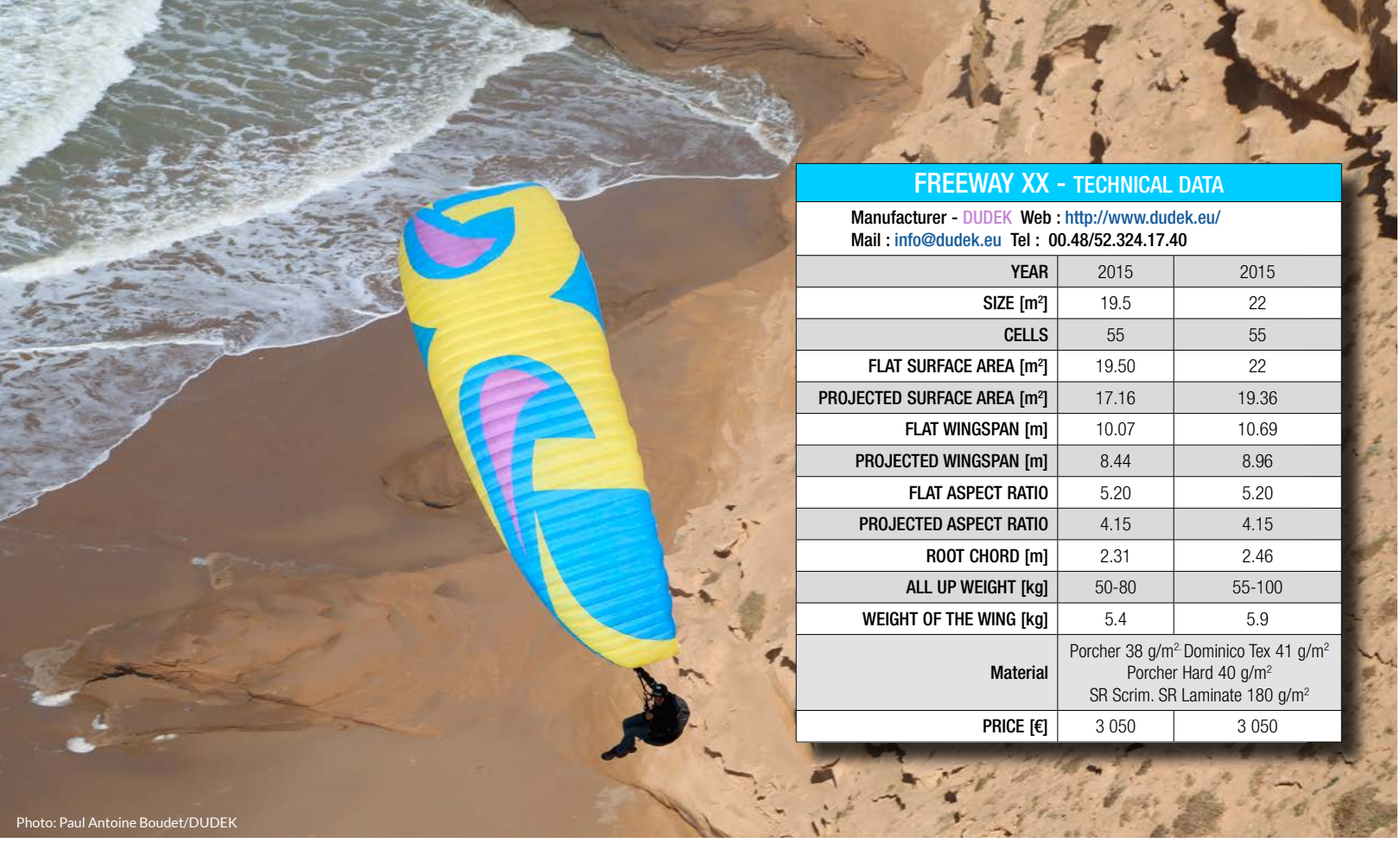


Photo: Paul Antoine Boudet/DUDEK

FREEWAY XX - TECHNICAL DATA

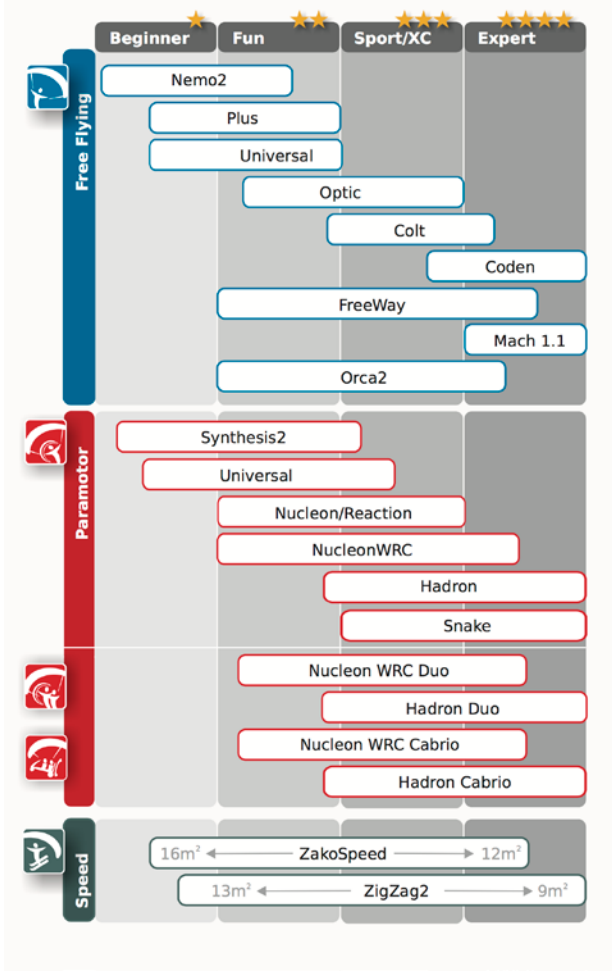
Manufacturer - DUDEK Web : http://www.dudek.eu/
Mail : info@dudek.eu Tel : 00.48/52.324.17.40

YEAR	2015	2015
SIZE [m²]	19.5	22
CELLS	55	55
FLAT SURFACE AREA [m²]	19.50	22
PROJECTED SURFACE AREA [m²]	17.16	19.36
FLAT WINGSPAN [m]	10.07	10.69
PROJECTED WINGSPAN [m]	8.44	8.96
FLAT ASPECT RATIO	5.20	5.20
PROJECTED ASPECT RATIO	4.15	4.15
ROOT CHORD [m]	2.31	2.46
ALL UP WEIGHT [kg]	50-80	55-100
WEIGHT OF THE WING [kg]	5.4	5.9
Material	Porcher 38 g/m² Dominico Tex 41 g/m² Porcher Hard 40 g/m² SR Scrim. SR Laminate 180 g/m²	
PRICE [€]	3 050	3 050

DUDEK

The Polish manufacturer offers a large range of paramotor and paraglider models. The latter are often less well known, despite their illustrious ambassador, Jean Baptiste Chandelier, developer of freestyle wings.On that note, the 'FreeWay' is now available in a modernised version, the 'XX'. Dudek promise good pitch stability and a dynamic roll. It is well suited for beginners in Freestyle/Acro, but can climb thermals too.

http://www.dudek.eu/en/



AIR DESIGN

The superlight version of the Volt 2 has been certified LTF/EN C in sizes S, SM and M.

The Volt 2 SL is made with Porcher Skytex 27 which has a coating on both sides. The lines have been reduced by 10% in size M. The wing weighs 3.6 kg in XS (60-75 kg). The size L of the Volt 2 isn't available in 'superlight'.

http://ad-gliders.com/en/

AIRCROSS

Photo: Karine Dupreur

With the U Cruise, AirCross have launched their new high end EN B model. It has a SharkNose, 65 cells, an aspect ratio of 5.6 and will be made in four sizes.

www.aircross.eu

AEROTEST DO IT ALL

Lots of pilots don't know it, but the Fédération Française's (FFVL) Aérotest laboratory still exists and is doing more and more certifications. The in flight tests are done on a winch above a lake in northern Spain. The EN and DGAC structural tests are done at Millau in France.

RSULTRA

It is now possible to take off from a beach or the Sahara desert on a Kangook trike. The Balloon Wheels kit is available as an option on all the make's trikes. Owners of Basik or KX1 trikes can update them with this new kit.

www.kangook.ca

FRESH BREEZE

At Fresh Breeze they have taken, as they often do, a bit more time before adapting and approving a new engine. Now the Polini Thor 80 can be ordered with the Sportix chassis.

The "unbreakable" X-One trike is now available with certification to be towed on the road as a trailer.

http://www.fresh-breeze.de/en/

UP

There are two things new at UP: The Makalu 4 is a new version of this 'low EN B' wing.

Also completely new: the Kibo, a wing which is mid EN B, between the Makalu 4 and the Summit XC3.

www.up-paragliders.com

Photo: Wolfgang EHN

UP

KIBO

KIBO- TECHNICAL DATA				
Manufacturer - UP -Web: http://www.up-paragliders.com/en/ Mail : info@up-paragliders.com Tel : +49 (0) 8821 73099 0				
YEAR	2016	2016	2016	2016
SIZE	S	S/M	M	L
CELLS	49	49	49	49
FLAT SURFACE AREA [m²]	22.9	24.9	27.0	29.0
PROJECTED SURFACE AREA [m²]	19.2	20.9	22.7	24.3
FLAT WINGSPAN [m]	11.5	12.0	12.5	12.9
PROJECTED WINGSPAN [m]	8.9	9.3	9.7	10.1
FLAT ASPECT RATIO	5.7			
PROJECTED ASPECT RATIO	4.1			
ALL UP WEIGHT [kg]	65-85*	75-95*	85-110	100-130
WEIGHT OF THE WING [kg]	4.4.	4.75	5	5.4
CERTIFICATION	in progress	in progress	LTF/EN B	in progress
MATERIAL	Porcher Skytex 38 Universal			

Photo: Jorge Atramiz

PARATROC

Paratroc now have a new range of T-shirts, FLY WITH ME available as a T-shirt for men and women and unisex with long sleeves. The T-shirts are 100% cotton and printed in two colours.

Prices range from 19 € with short sleeves to 25 € with long sleeves.

Available on the Paratroc site and through certain paragliding distributors.

www.paratroc.com

X-PYR 2016

On the 17th of July, the Hike and Fly race, the X-Pyr 2016, will get underway for the third time. It crosses the Pyrenees from west to east, covering nearly 450 km. This year it will bring together 37 teams from 17 countries. On the start line, there will be Chrigel Maurer, Toma Coconea and Aaron Durogati, amongst others.

www.x-pyr.com

TREKKING

The manufacturer Trekking, which now makes all their Senso Sport wings in France, also makes the new Pouf bag there too. It's simple, made from light-weight 40 g fabric, practical with three laces to do it up and has a compartment for storing the risers.

www.higlider.com

Photo Lucian Haas

VONBLON

The reversible harness from Vonblon, the Nexus, is a reworked version of the old Paratech R1, which was also created by Vonblon.

http://www.vonblon.com/

INSTRUMENTS

New instruments were much talked about at the Thermikmesse trade show. A lot is happening in this respect. Flytec have brought out a new version of the Element, the Speed, which has been optimised for measuring speeds.

The Skytraxx 3.0 is finally here with its highly contrasted colour screen (the old Skytrax 2.0 is still available).

Syride's whole instrument range is now in its third version. Amongst other things, the components consume even less and the increase in battery life is amazing.

All new and available for the first time at Sindelfingen, the XCTracer Mini (30g), the XCTracer's little brother, is an instrument which integrates the measurements from a gyroscope and an accelerometer to detect thermals. We briefly introduced it last year.

As a result, other manufacturers like Flymaster and Syride now also offer a 'vario' function using this type of sensor. At Naviter, the Oudie 4 has come out. We will test these in detail and report it all in our special article about 'Instruments' in our next issue.

THE SWAN PROJECT

Sacha Dench is a former free fall champion who has since been converted to paramotoring. An Australian living in Great Britain, she is heavily involved in bird protection, especially of the Bewick's Swan, a Siberian sub species of the Tundra swan.

To raise awareness about the decline of this species, Sacha wants to fly with them, on a paramotor, accompanying the birds on their migration from Russia to England. For the 7000 kilometre flight, she hopes to use a machine from Fresh Breeze who have already announced their support for this endeavour.

https://www.facebook.com/flightoftheswans/?pnref=story

For those who want to fly high

Cross country flights become child's play with the new Flytec Element. This highly precise vario sports a new kind of keyboard for better tactile feedback – even with gloves on. It guides you high up into the air, its GPS points you in the right direction and shows the way the wind blows. Thanks to airspace warnings you always stay on the safe side. And after landing, records of your adventures are immediately available for Google Earth and online contests. **element.flytec.ch**

Flytec

TEST
NIVIUK
IKUMA
23 25

Photo: V. Burkhardt

Photo: V. Burkhardt

Long awaited in the Niviuk range: a high end EN B, which is a very popular class. The Ikuma fits in between the Hook and the Artik, and is fairly close to the latter.

BY CÉDRIC NIEDDU AND SASCHA BURKHARDT

At Niviuk, the EN C machine for going XC is the Artik (which came out in its fourth version in 2015). The Ikuma is supposed to provide a high-end EN B wing, which Niviuk call "EN B+" and/or "Back Country". This type of wing which is 'still EN B but almost EN C', is clearly a trend. Niviuk promise a wing which will allow you to 'fly the most stunning XCs thanks to very high levels of both performance and safety', indeed 'exceptional passive safety for this level of performance'. Another promise: 'passion and ambition in total harmony, with this safe, fun wing'.

To fulfil these specifications, of course, Niviuk used all the modern technology available: SharkNose, Nitinol leading edge rods and Mini Ribs in the trailing edge. In keeping with the current trends, the wing has also been made lighter, in particular by opening up the vents in the cell walls.

The risers have also become thinner and, in particular, the lines are unsheathed from top to bottom. The pulleys on the accelerator are very efficient, but seem almost outsized on these thin straps. On the (rear) C risers there is a control handle: evidently this wing is aimed at XC pilots (too).

Photo: V. Burkhardt

Photos: V. Burkhardt

A classic technique which has no doubt contributed to the excellent handling of this wing: the system shortens the trailing edge through the brakes.

Below: a thinner riser with efficient pulleys for the accelerator. Note the brake handle on the Cs.
Niviuk use an unusual mix of materials for the lines: the lower lines, in Aramid, are all unsheathed except for a few centimetres around the maillon.

Photo: V. Burkhardt

Photo: V. Burkhardt

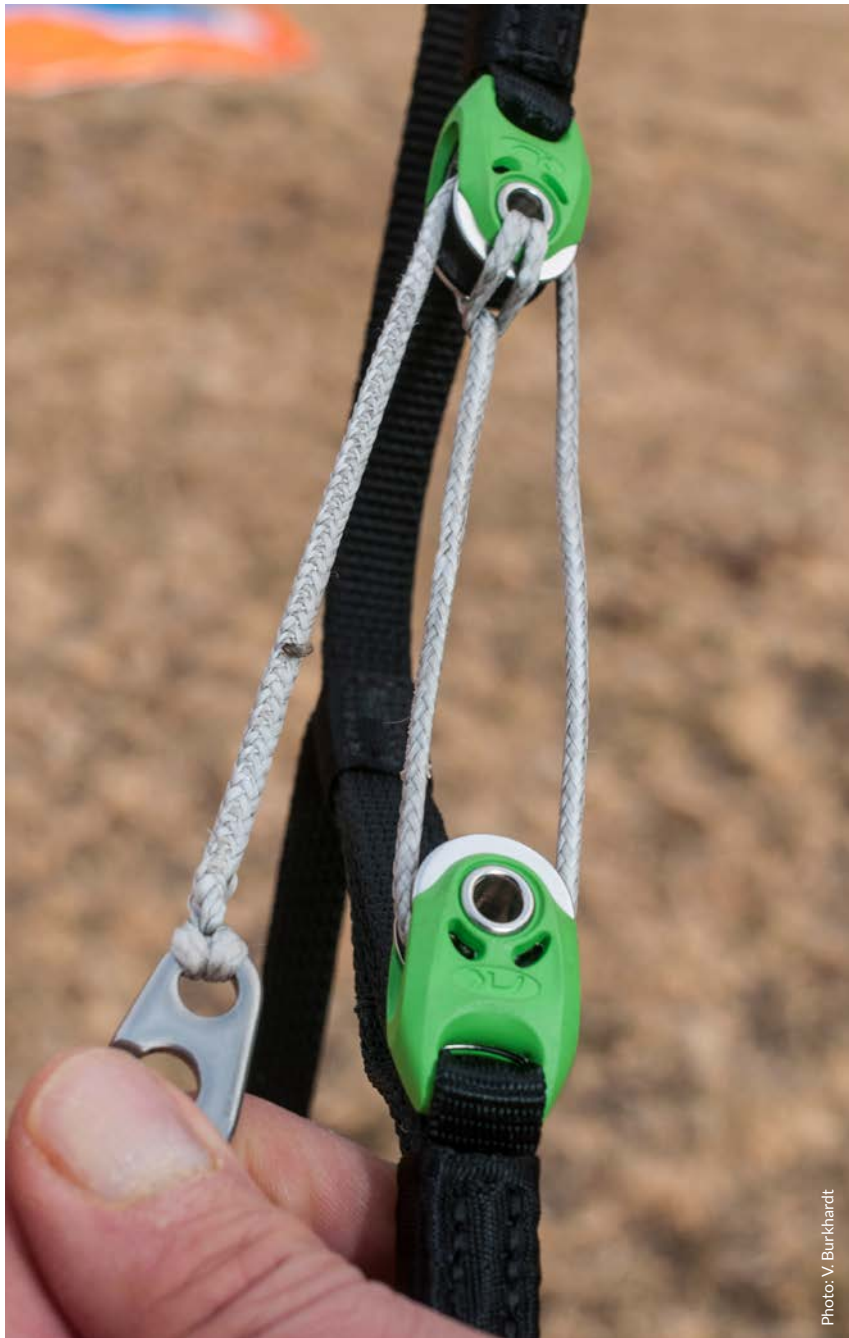


Photo: V. Burkhardt

For those new to the world of XC flying, the hotter EN C/EN D style wings are often controlled through the rear risers, especially for little corrections during a transition, so as not to 'brake' the performance.

INFLATION AND TAKE-OFF

The Ikuma comes up well, but it misses a little bit of feeling at the start of the inflation and is a bit like a 'block'. But as soon as it comes up above the pilot, it is very solid. Facing the wing at take off with a turbulent wind, you need to work a bit on the wing tips, which is only normal. Overall it's a wing which behaves well during take-off and quickly takes up the load. In strong wind, it can even take the load up a bit too quickly if the pilot isn't paying attention.

FLYING STRAIGHT

The wing glides very well; it's surprising how compact and balanced it is. The Ikuma calmly crosses turbulence and transforms the movements in a positive way. Obviously it can still close a tip in turbulence if you don't control it on the opposite side, but it remains, almost always, exceptionally efficient. Is this balance and nice return due to good positioning of the SharkNose? There is no way of knowing, but the result is there. Its actual performance in turbulent air effectively puts it near the Artik, whilst remaining well behaved. As far as speed is concerned, Cédric measured about 38 km/h / 51 km/h on the 25, with an all up weight of 90 kg.

Photo: V. Burkhardt

The ears are efficient.

Photo: V. Burkhardt

IN THE TURN

During the initial brake travel, the wing turns relatively flat, but always very precisely, despite the relatively large amount of travel. As soon as you brake a bit more, it starts to roll substantially as well. It has to be said that the 'fun' part of the specifications is, without a doubt, perfectly achieved: its precise controls and reactivity are a real success, especially if you work on the outside brake too. In a spiral it sets off fairly fast and fairly strong in keeping with its manoeuvrability. It needs to be managed prudently during this part of the flight.

MANAGING A FLYING INCIDENT

This wing doesn't hold any nasty surprises, but requires more precise control to manage its energy than a low EN B wing would. Although it is more accessible than an Artik, the Ikuma isn't aimed at pilots coming out of school.

CONCLUSION

Its handling, playful side and good balance in turbulence let you easily make the most of the performance of this EN B+ wing. The promises in the specifications have definitely been realised, and in a fairly astonishing way.

IKUMA - TECHNICAL DATA

Manufacturer : Niviuk - http://www.niviuk.com Mail : info@niviuk.com

YEAR	2015	2015	2015	2015	2015
SIZE	21	23	25	27	29
CELLS	57	57	57	57	57
FLAT SURFACE AREA [m²]	21	23	24.5	26.5	29
PROJECTED SURFACE AREA [m²]	17.83	19.53	20.75	22.44	24.56
FLAT WINGSPAN [m]	10.94	11.45	11.82	12.29	12.86
PROJECTED WINGSPAN [m]	8.72	9.13	9.42	9.8	10.25
FLAT ASPECT RATIO	5.7	5.7	5.7	5.7	5.7
PROJECTED ASPECT RATIO	4.26	4.26	4.26	4.26	4.26
ROOT CHORD [m]	2.33	2.44	2.52	2.62	2.74
HEIGHT OF LINES (m)	6.67	6.98	7.2	7.49	7.83
ALL UP WEIGHT [kg]	55-75	65-85	80-100	95-115	110-130
WEIGHT OF THE WING [kg]	4.4	4.65	4.85	5.15	5.6
CERTIFICATION	EN/LTF B+				
MATERIAL	S9017-E25 38 g/m² Dokdo N20DMF 35 g/m²				
PRICE [€]	3800	3800	3800	3800	3800

Photo: V. Burkhardt

TWO YOUNG PILOTS GIVE THEIR OPINION OF THE IKUMA

16 year old Valentin Gilet, a pilot in the sports section of the Font Romeu Lycee in France, has been flying for nearly three years. He has done about 200 flights and has approximately 100 hours under his belt. He tried several wings, like the Rush and the Rook, before buying the Ikuma to replace his Epsilon 6.

"The Ikuma is lively and nice to fly and it turns efficiently. It responds well to the outer brake.

Its glide is very good for a wing of this category, even though I found the Rush had better performance.

On the other hand, the Ikuma is nicer to fly. In addition, it gives lots of feedback, it 'talks a lot' and it enters a spiral strongly."

16 year old Alix Boudon is also a pilot in the sports section of the Font Romeu Lycee. He has been flying for three years, done about 150 flights and clocked up about 108 hours. He did six flights (five hours in total) on the Ikuma 23 with a view to buying one. However, taking into account his level, his coaches advised him to buy an Artik 4, but he still has very good memories of the Ikuma.

"Compared to other EN B+ wings, it offers more feedback and it marks little bubbles of air better. The controls are very consistent and it's excellent in the glide. Accelerated, the leading edge remains very solid. Personally, in wide thermals, I have always flown with a loop of brake around my fingers to keep my hands a bit higher and to give it a bit more of an angle in the turns. In weak conditions, on the other hand, without a loop of brake, it allowed me to learn to improve my turning technique and to turn flatter than before. In spirals, it's a wing which engages strongly and which can also be impressive."

TEST

SKYWALK CAYENNE 5

XS, S

Photo: Philippe Pizzinato Pilote: Pascal Kreyder

Photo:Tristan Shu/Skywalk

With version 5 of the Cayenne, Skywalk wanted to raise the bar higher than with previous versions. Higher aspect ratio, more cells and even less drag...

By Pascal Kreyder

THE CAYENNE 5 S WITH 96 KG ALL UP WEIGHT

The range of the wing tested was 85 kg to 105 kg. The construction is very good quality putting it in the lead gaggle with the best makes in the world. The 69 cells and 6.41 aspect ratio impress. The Liros Edelrid lines are unsheathed high up (0.4 and 0.5 mm), 0.8 mm in the pyramids and sheathed but thin (1.4 mm), below.

TAKE-OFF

15 km/h northerly on a site at Annecy. At take-off, the breeze is strong and the lake sparkles with the alternating sun and cloud. The wing inflates easily and, despite the wind on take-off, there is no spinnaker effect. The slow take up helps keep it in control or the pilot to recentre himself if necessary. No need to over brake the wing at the end of its rise.

FLYING

Right from the first few metres you can feel the temperament of the wing. It crosses the ephemeral bubbles at the start of the convection giving a strange sensation of everything being soft. What should have been disorganised and difficult to use, seems obvious and almost easy.

The wing immediately makes you feel confident. Using thermals is intuitive, even if personally I am used to more roll going into a turn. The flat yawing turn is a little disconcerting.

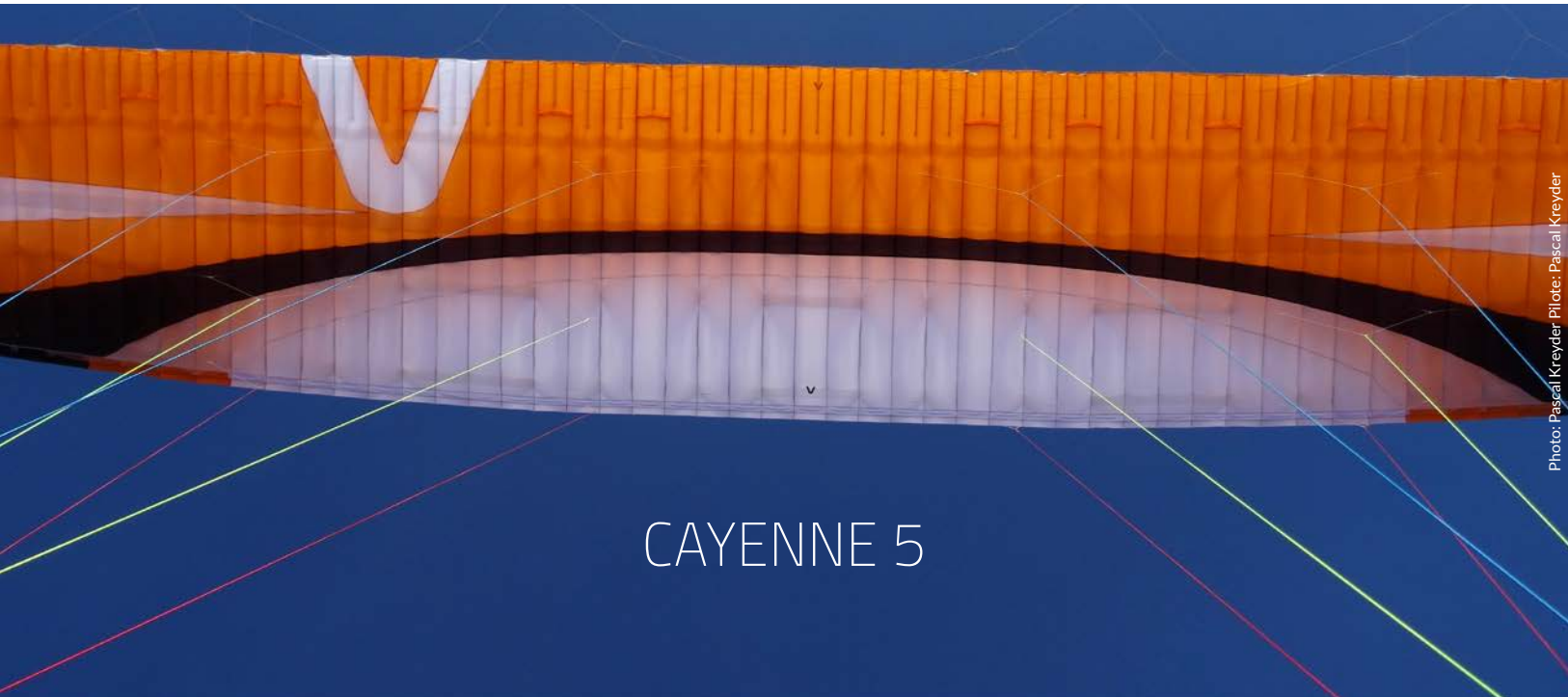
By exaggerating the weight shift in the harness, the wing's response is immediate, the turn accelerates and the wing spirals progressively

Alain Anthony came and joined me on his Enzo 2. Our two trajectories were parallel, but his was a lot faster. I didn't need to correct the direction with the rear risers. The wing had no roll, even when it was 'left to fly'.

Crossing thermals required no input on the controls; any corrections to the direction were easily done by weight shift. The thermal was a very difficult one: chopped up, layered and weak lower down. Once out of the thermal, the wing bit and didn't hesitate going into the next turn. I found myself above the hill and so I opened the waist strap to its maximum. Closing my eyes for the roll, I let myself be carried purely by feeling. By letting the wing fly without any constraints, the flat turns followed the flow of the thermal. The technique paid off and the vario beeped at more than 2.5 m/s.

An into wind transition gives lots of feedback. The wing is really very comfortable in this situation. The parasitic effects from strong wind and crossing thermals are filtered and damped. The confidence level is almost at its maximum. I put my foot to the boards and my hands on the Cs without straps or hand rest loops. There are no corrections to give to the wing. It continues to calmly fly in the same direction. Return to take-off is guaranteed.

Above, the Cayenne 4. Below, the Cayenne 5: an obvious choice for better performance. Success!



Landing is a simple formality, even if you have to manage the turbulence from the North. Small corrections with the brakes allow the wing to penetrate well in this broken up, uncomfortable, turbulent wind.

CLOSER TO THE LIMIT

The next day, the turbulence in the lee of the relief has increased. In a bit of strong turbulence, the controls go slack, the left side collapses, I counter with weight shift and correct slightly on the right with the brake. The pressure also disappears and, whilst the left side reopens instantly, the right side collapses in turn. Both controls have no pressure and so to avoid over-piloting, I decide to let my hands up.

At the same time, the wing starts lifting again and does a nice, slightly oblique, pitch forwards. Once it has gone past 45°, the pitch forward slows down by itself, and the wing goes back to normal without any sizeable residual oscillations.

CAYENNE 5 XS, 95 KG ALL UP WEIGHT

I was able to try the XS at the upper limit of its all up weight, at three different sites and with two different harnesses. The difference in behaviour between an S loaded at the middle of the weight range and an XS loaded to the maximum is huge, really amazing. In fact the XS is a lot less relaxing than the S and reacts with less damping when entering a thermal.

Each bubble makes the wing jump up slightly, whilst the bite when going into lift propels the wing and the pilot forwards. Going into a thermal doesn't make the wing go nose up, neither does leaving a thermal make it dive. In general, the XS clearly wants to go forward in into wind transitions.

Photo:Tristan Shu/Skywalk

MEASUREMENTS

For the XS loaded to 4.18 kg/m², at 1600m and 16°, 39 km/h trimmed, 54 km/h accelerated speed. Comparative flights with a Delta 2 SM loaded to 96 kg: on several transitions in calm air, trimmed, the glide was identical. On the second bar, and still in calm air, the glide is slightly better on the Cayenne 5 and the speed is identical. When going XC in turbulent bumpy air, the Cayenne 5 is clearly better when accelerated to the maximum. The C5 moves a lot less than the Delta 2. With each correction of direction or stability, the Delta 2 clearly loses several metres on the horizontal plane.

PERSONAL CONCLUSION

The Cayenne 5 is aimed at pilots who already have lots of experience of EN C wings, but are looking for the 'bite' of a D. Skywalk have hailed a brand new Cayenne, easier, with much better performance and more comfortable than its predecessor.

CAYENNE 5 - TECHNICAL DATA

Manufacturer : SKYWALK Web : http://skywalk.info/fr/produits/cayenne5/ Mail : info@voiles4saisons.com

YEAR	2015	2015	2015	2015
SIZE	XS	S	M	L
CELLS	69	69	69	69
FLAT SURFACE AREA [m²]	22.68	24.10	26.07	27.85
PROJECTED SURFACE AREA [m²]	19.43	20.65	22.34	23.87
FLAT WINGSPAN [m]	12.06	12.43	12.93	13.36
PROJECTED WINGSPAN [m]	9.78	10.08	10.48	10.84
FLAT ASPECT RATIO	6.41	6.41	6.41	6.41
PROJECTED ASPECT RATIO	4.92	4.92	4.92	4.92
ALL UP WEIGHT [kg]	75-95	85-105	95-115	105-130
ALL UP WEIGHT Max [kg]	80-90	90-100	100-110	110-120
WEIGHT OF THE WING [kg]	5.0	5.2	5.5	5.8
MATERIAL	Porcher Skytex 38 for the upper sail. Skytex 32 for the lower sail and Skytex 32 hard for the ribs.			
PRICE [€]	4 200	4 200	4 200	4 200

Photo:Tristan Shu/Skywalk

After testing the S, we found that the adjectives used were almost less than the reality. This wing gives everything without (almost) asking for anything back, even in marginal flying conditions.

The size S seems a lot easier, more tolerant and damped than the XS. Over and above the difference in wing loading and size, which already implies a different feel, the difference between the behaviour of the two sizes is striking, apart from the precision in the controls, which is very similar.

OTHER OPINIONS

Thomas, a sports pilot on a Delta 2, tried the S.
"The gain in performance is obvious and immediate without conceding anything. The flat turn is different to that on the Delta, easy to understand and makes ground level saves possible. The controls are precise but a bit harder than on the Delta."

Jean, a pilot used to an EN D, tried the XS.
"I bought this wing so that I would no longer have to manage a demanding D. I lost nothing in the performance compared to my previous EN D wing, but I gained in comfort and calm. The flights seemed more accessible and, as a result, I was better able to watch what was going on and to attack. In the end, I am not any slower than my friends on their Mantra 6s or GTO 2s."

René, is used to flying EN B wings.
"Take off wasn't any more difficult than with my Mentor. On the other hand, once airborne, I felt as if I was in another world. Yet the wing was docile and responded to everything I asked. At no time did I feel left behind or overwhelmed."

THE PLUSES AND MINUSES

THE PLUSES
+ Comfort at all times (on the S)
+ Total absence of rolling.
+ Performance in a flat turn: yaw/roll.
+ Precise commands.
+ Efficient in small thermals.
+ 'Useful' performance.
+ The performance of a D, on a C certified wing.

THE MINUSES:
- At take off, the S was slow to come up in the middle of the weight range.
- Ears which had a tendency to go in and out in difficult air.
- Easy and accessible (deceptive). See thoughts in the personal conclusion.
- The XS is more demanding.


Photo: Tristan Shu/Skywalk

TEST
NIVIUK
KOUGAR 2

The Kougar 2 uses all the tried and tested new technology.
Photo: Niviuk

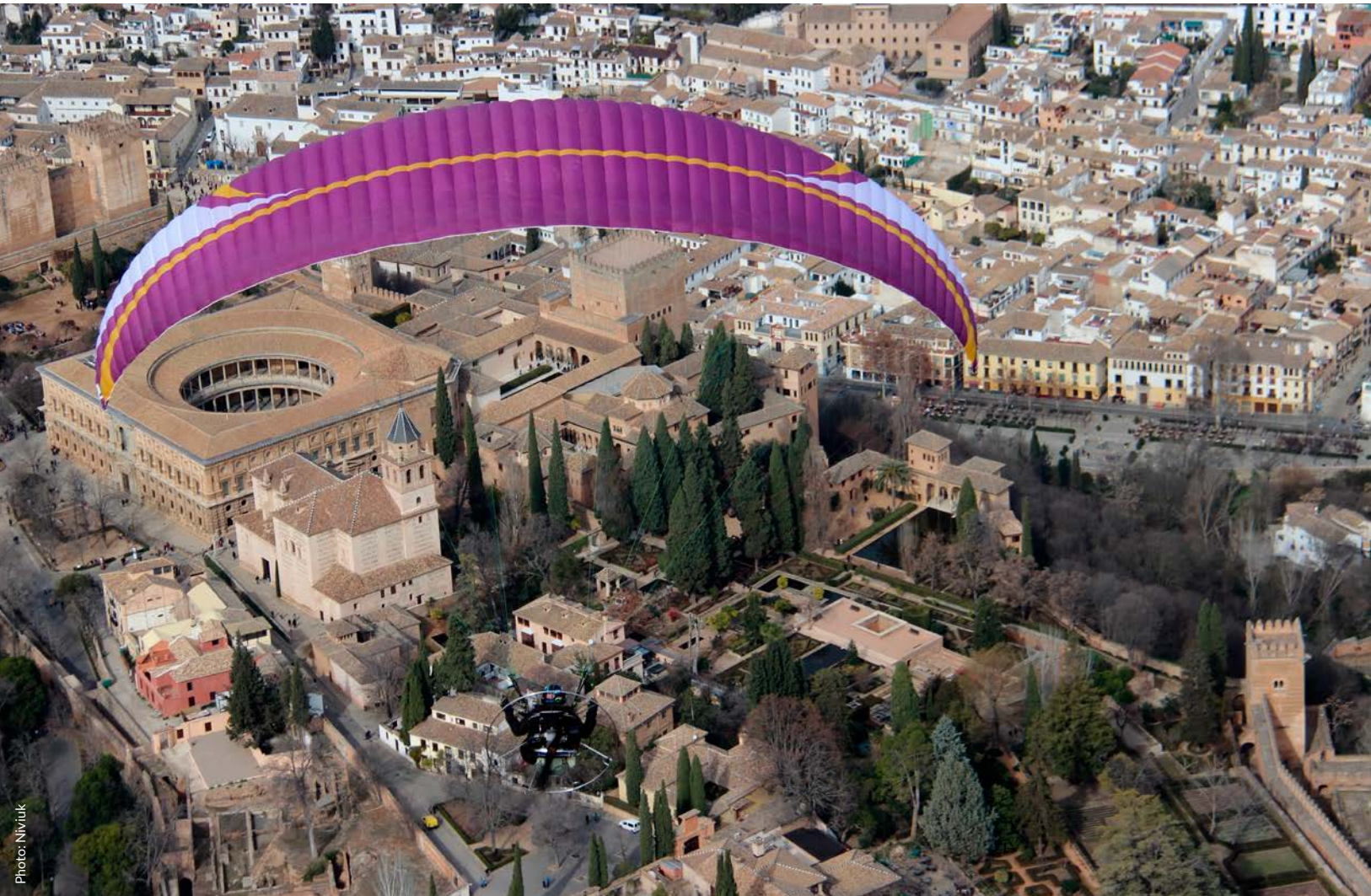
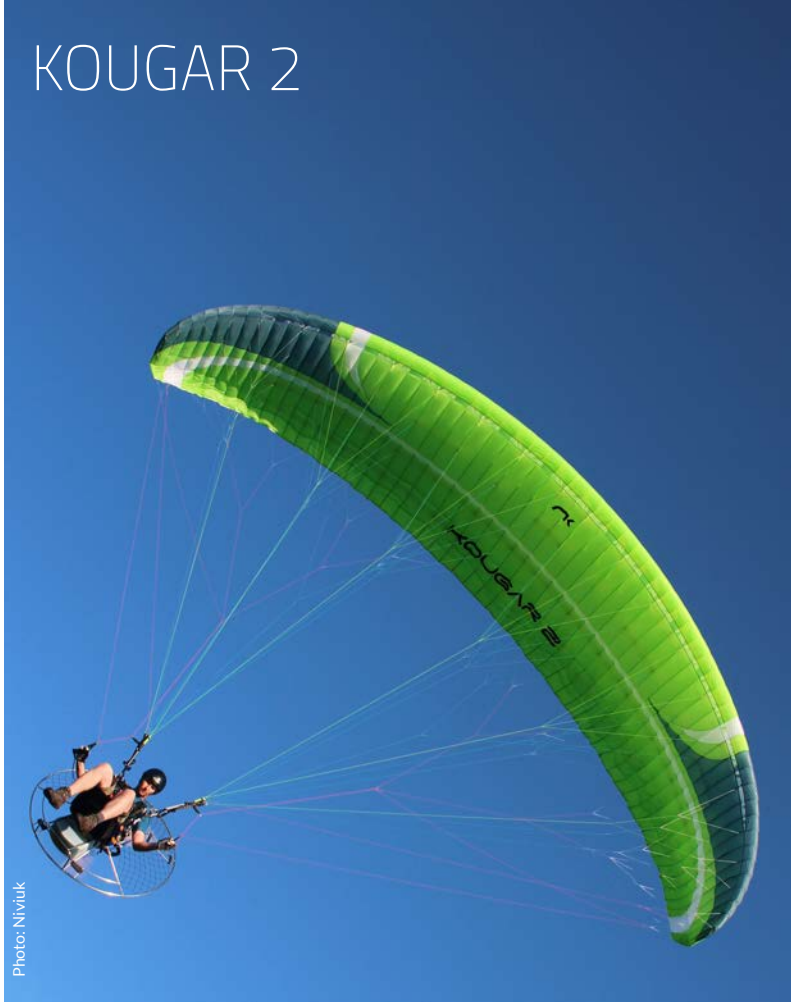


Photo: Niviuk



The Kougar 1 from 2011 had an aspect ratio of 6. The new version has slightly less (5.9), it lost 300 g in size 23, but gained a SharkNose, mini ribs and stiffening...

UNPACKING

The Kougar 2 in the test was 20 m², but looked fairly imposing in its bag, and not particularly light at 5.2 kg. Niviuk advocate attention to detail and the quality of construction of the Kougar 2 is in fact exceptional! It has SharkNose technology thanks to a pair of leading edge rods cleverly crossed, and all reinforced with Mylar.

You can also see the stitching for the 3D-shaping on the upper surface: it limits the folds in the fabric when the wing is flying by optimising the shape which develops. The lines are numerous but very thin, which guarantees that the profile is ideally maintained. On the risers, a little cord passes through a loop allowing the central Ds to be released when the wing is accelerated, which is another step towards optimising the shape of the profile depending on the stage of the flight.

The trimmers have little T shaped handles which allow them to be handled easily, even with big gloves. The trimmers have less travel, but the travel on the accelerator is greater.

Lastly, the Kougar 2 is equipped with double lines on each brake handle: when you bring your arm towards your chest only the tip of the wing is affected, which allows you to turn when you are untrimmed and accelerated. The centre of the wing is braked when you move your arms apart.

When braking normally, it will thus have an effect on both. Only the central line passes through the pulley. Its sixty cells, its 5.9 aspect ratio and the slender profile clearly show its niche: performance!

IN FLIGHT

Performance: a word which can mean everything and nothing, I hear you say. So is it fast? Manoeuvrable? Efficient? Yes, its performance comprises all of these things.

At first glance the Kougar 2 seems to have sufficient performance for classic competitions, where the wing needs to be fast, economical AND manoeuvrable…

We tested it with a small 15 HP 80 cc engine. This combination suits classic competitions. There was nil wind. Although it's fairly easy to inflate, the Kougar 2 isn't an arrow. It comes up more like a school wing, evenly, and without a tendency to overfly or horseshoe. This side of it is pretty cool!

Hit the throttle. Brilliant! Even with only 80 cc, I'm airborne in a few steps. Immediately there is a unique sensation which is difficult to describe: The Kougar 2 has a great glide, a characteristic which you often find on high performance paragliders. The impression of floating, of gliding, a real feeling of being airborne!Those who have flown the Viper will know what I mean! The climb rate is incredibly good with my 80 cc motor; this wing only needs a little bit of throttle.

Photo: Niviuk


Photo: Niviuk

KOUGAR 2 - TECHNICAL DATA

Manufacturer : NIVIUK - Web : www.niviuk.com Tel: 33 608 17 68 48

YEAR	2014	2014	2014	2014
SIZE	20	23	25	28
CELLS	60	60	60	60
FLAT SURFACE AREA [m²]	20	23	25.5	28
PROJECTED SURFACE AREA [m²]	17.28	19.88	22.04	24.02
FLAT WINGSPAN [m]	10.86	11.65	12.27	12.85
PROJECTED WINGSPAN [m]	8.88	9.53	10.03	10.51
FLAT ASPECT RATIO	5.9	5.9	5.9	5.9
PROJECTED ASPECT RATIO	4.56	4.56	4.56	4.56
ROOT CHORD [m]	2.25	2.41	2.54	2.66
HEIGHT OF LINES (m)	6.75	7.25	7.55	7.99
ALL UP WEIGHT [kg]	70-120	80-140	90-160	100-180
ALL UP WEIGHT PPG [kg]	70-140	80-160	90-180	100-200
WEIGHT OF THE WING [KG]	5.2	5.8	6.4	6.8
CERTIFICATION EN/LTF	926-1 DGAC			
MATERIAL	S9017-E77A 40 g/m² Dokdo N20DMF 35 g/m²			
PRICE [€]	3 300	3 300	3 300	3 300

Cruising only requires a few revs, thus confirming in part its performance. When turning, the Kougar 2 is consistent on all its axes. Manoeuvrable and very precise, it turns without you having to pray; it doesn't hold any surprises and doesn't over react. I do a little slalom near the ground, alternating the turns to the right and left, playing with its pitch and its low fuel consumption. This is a great way to learn to anticipate and to handle the axes.

Untrimmed, the Kougar 2 really accelerates, despite the short travel. Its paragliding side then gives way to its paramotoring side: the pitch is a lot more damped and the controls become stiffer. It remains nevertheless totally flyable with the brakes, in this configuration.

Coming out of a tight bend, the Kougar 2 pitches backwards a lot less than when it is trimmed. This is a positive point which shows that it will be demonstrative in thermals when it's trimmed, (being lightly damped in the pitch is essential with a tendency to nose up during an input of external energy) and will handle nicely when it is untrimmed (strong damping in the pitch is essential, with a tendency to eliminate the pitch backwards at the end of the turn).

Whether trimmed or not, to optimise the turn and make it efficient and aesthetic, it's worthwhile to first of all brake the wing tip, and then follow with the main brake. In the same way, the wing tip controls are effective at countering pendular rolling movements. The accelerator bar is easy, not physical, which is great for long flights in a competition or for not being late for beer o'clock. It reduces even further the pitch backwards at the end of a turn, for example when you're doing 'pylons', even though the Kougar 2 isn't designed for that.

The wing is very solid and predictable, has no nasty tricks and doesn't feel fragile even when being pushed to its limit. A few big wingovers confirm that. The SharkNose seems to play its role, and the profile doesn't seem particularly fragile within the limits of normal flight, whether with a large or small angle of attack.

Two weeks later, flying in weak thermals, trimmers closed to have the minimum sink rate and the least damping in the pitch. It was easy to visualise the little bubbles thanks to the feedback through the controls and the harness. Even if the conditions were weak, I managed to battle on with my vario reading more than +0.5 m/s with the motor cut. I managed to climb a few hundred metres with the motor off. Very good.

The Kougar 2 can turn relatively flat to make the most of its projected surface, but its good manoeuvrability allows it to easily find the core of a thermal and make the most of it. The light controls are a non trivial advantage, and you can turn for a long time without wearing out your arms. Once at cloudbase, you just need to de-trim or accelerate to move on quickly towards the next thermal. I have the same sensation: it goes fast, but the glide doesn't seem to suffer at all in this type of flying, contrary to most reflex wings where the glide is then completely degraded. The glide here is excellent. Niviuk seem to have found a really efficient profile.

CONCLUSION:
The Niviuk Kougar 2 is a wing which is accessible to pilots looking for, above all, performance and excellent passive safety.

This reflex wing sits with most other reflex wings, as it has low consumption at every stage of the flight. Fast and very economical, it can quickly cover long distances. Manoeuvrable and with light controls, the pilot can really enjoy himself. All in all, it offers a very high level of passive safety, which makes it accessible to pilots coming out of school who are progressing fast.

You're looking for a wing for gliding? To get points in a classic style competition? For playing about close to the terrain? The Kougar 2 is without a doubt made for you!

Video:
www.youtube.com/watch?v=hfA1Jy7TMYY

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OZONE ROADSTER 2

In 2008, we tested Ozone's first 'officially reflex' wing, the Roadster. It's a wing with a moderately reflex profile and suitable for intermediate pilots. Seven years later, Ozone brought out the second version, with the same aspect ratio of 5.1. It's 500 g lighter and obviously has a SharkNose as well.

By Sylvain Dupuis

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

Above, the Roadster 1 during our test in 2008. Right, the Roadster 2 at the end of 2014. The marriage between reflex and shark has been a success and makes this wing even more accessible...

The reflex profile has, of course, become a reference amongst paramotorists. It is self stabilising and therefore a lot (lot, lot) more solid and comfortable in turbulence.
What's new is that now it can be combined with the SharkNose. This allows, as everyone already knows, the pressure to be kept constant in the wing during extreme angles of attack (low and high). A collapse and stall are less likely than on a profile without a SharkNose as the pressure helps the wing to stay in shape.

The rest is fairly standard: the fabric is 40 g/m² and the lines are Edelrid. The risers are simple; they have trimmers and an accelerator with normal travel. A small control to each wing tip makes it steerable even at maximum speed, where the brakes shouldn't be used. During normal flight they can be used in addition to the brakes to increase the manoeuvrability.

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

IN FLIGHT

The nil wind conditions are similar to those that a beginner could encounter. With trimmers closed, I pull on the front, followed by on the rest. The Roadster 2 goes up effortlessly.

It came up without hesitating, without sticking, in short, without any difficulty at all, despite its 24 m² and the absence of wind. The small 80 cc motor purred behind me. Time for some throttle... In just a few steps I was flying, without needing to bury the brakes. The load take up was perfect, just like the inflation. I play close to the ground on the Roadster 2: it has no lack of manoeuvrability! The brake travel is fairly long, but the brakes are light. You can have a lot of fun on this wing, without having the impression of maltreating it through the controls!

It is damped on all the axes without being excessive, making it playful but without any surprises for a beginner. An 80 cc motor is amply sufficient for a 70 kg (naked) pilot. I can play near the ground without being taken by surprise. Its yield seems excellent! Trimmers off, the speed increases from 38 km/h to 45 km/h, which is respectable for a beginner's wing. The controls of the Roadster 2 become stiffer in this regime, but it remains manoeuvrable and playful.

I notice that the pitch is still a bit more damped, and the balloon effect (pitch backwards coming out of a turn) is smooth. The controls at the wing tips combined with the brakes increase the manoeuvrability.

In the end, the Roadster isn't too bad for doing slalom. Obviously it isn't a competition wing, but it is manoeuvrable and fairly fast. It's a good way to get started!

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

ROADSTER 2- TECHNICAL DATA

Manufacturer - Ozone - Web: www.flyozone.com Mail: team@flyozone.com

YEAR	2015	2015	2014	2014	2014
SIZE	20	22	24	26	28
CELLS	48	48	48	48	48
FLAT SURFACE AREA [m²]	20	22	24	26	28
PROJECTED SURFACE AREA [m²]	17.2	18.9	20.6	22.4	24.1
FLAT WINGSPAN [m]	10.1	10.59	11.06	11.52	11.95
PROJECTED WINGSPAN [m]	7.93	8.32	8.69	9.04	9.39
FLAT ASPECT RATIO	5.1	5.1	5.1	5.1	5.1
PROJECTED ASPECT RATIO	3.7	3.7	3.7	3.7	3.7
ROOT CHORD [m]	2.54	2.67	2.79	2.9	3.01
ALL UP WEIGHT [kg]	50-70	55-80	65-85	80-100	95-120
ALL UP WEIGHT PPG [kg]	55-100	55-105	65-120	80-140	95-160
WEIGHT OF THE WING [kg]	5.12	5.25	5.43	5.68	5.88
CERTIFICATION			B	B	B
Material	Top Surface Cloth: Dominico 30D MF Bottom Surface Cloth: Dominico 30D MF Rib cloth: Dominico 30D FM Upper lines: Liros DSL70 Mid lines: Liros DSL70/140 Lower Lines: Edelrid 7343-230/190				
PRICE [€]	-	3200	3200	3250	3300

I gain a little altitude to check its speed limitations (low and high) by doing a series of wingovers. There is no tendency to collapse or deflate as long as the timing is correct. The Roadster 2 does nice wingovers; it feels very solid no matter what the speed, no doubt a result of the SharkNose! Some turbulence starts to develop. I go into 'full speed' mode (trimmers off and speed bar on). The speed then exceeds 53 km/h, an excellent average for a wing of this level. The rear lines slacken, and the turbulence is absorbed with no problem. I feel totally at ease, without any discomfort. In fact I feel totally confident! Here, I can't touch the brakes; turning needs to be managed using the controls on the wing tips, which are very efficient, even in tight turns.

Even when trying it on a bit, and doing 'what you're not supposed to do', I didn't manage to collapse the Roadster 2; it always stayed on the rails. In short, I would lend it to my girlfriend without hesitating. The landing was, with trimmers on, as if on egg shells and without any surprises. Nice toy!

Photo: Lucille Pointeau Pilote: Sylvain Dupuis

The typical criss-cross of the leading edge rods on a SharkNose.

Photo: Lucille Pointeau

CONCLUSION

The Roadster 2, a wing with a reflex profile aimed at beginners (but not exclusively!) was a successful bet by Ozone. Far from being sterile, the Roadster 2 is a great fun wing which you can start on, but also progress with, to perfect your flying technique. Sufficiently effective in thermals, and fast enough for long trips, the Roadster 2 is a bit of an all round wing without compromising its passive safety. If the Roadster 1 was a wing which we mainly recommended for intermediate pilots, the Roadster 2 covers a larger range of pilots, including beginners. The SharkNose combined with the reflex profile has no doubt contributed to this increased flexibility...

Photo: Emilia Plak / Ozone

THE ROAD
TO THE SNAKE

OZONE
VIPER 3

Photo:Véronique Burkhardt Pilote: Sascha Burkhardt

Photo: Sascha Burkhardt
Slithering: the Vipera aspis zinnikeri

The Viper range clearly shows the R&D route taken over the past ten years, including reducing the weight of paramotor wings and improving their behaviour in flight. Last year, Sylvain Dupuis tested the Viper 3 for us and compared it to the first version.

By Sylvain Dupuis

The Viper back in 2007 wasn't really a wing like any other. Ozone had created a real myth, a very high performance wing that was ahead of its time and is still competitive today. At the time it allowed Mathieu Rouanet, Laurent Salinas and Alex Mateos to sweep up all the medals during the 'belle époque'. It was in some respects, the cross breeding of a very ecological paraglider with a highly manoeuvrable energetic acro wing, which resulted in speeds which are fairly close to today's standards. A wing close to perfection, except that it was really reserved for top level pilots. Hence the birth of the Viper 2: calmer but with the trade off of less performance and less fun. Therefore Ozone needed to come up with a worthy descendant and bring back the playful side. Bring on the Viper 3.

The 20 m2 Viper 3 allowed me to make a direct comparison with the 'customised' 20m2 Viper 1 that I have used for years. Mass produced, the V1 was normally just made in 24 and 27, although Mathieu and Laurent flew custom made 15 m2 and 18 m2 prototypes.

Unpacking it, I'd never seen a wing with so few lines! By taking a riser and gathering together all the lines, you get a bundle which must be roughly 5 mm in diameter. Incredible! The writing is on the wall: no more drag!

Photo: Lucille Pointeau Pilote: Sylvain Dupuis

The brake lines at the wing tip are separate, as with the Slalom. The travel in the trims is normal, about average, and it's the same for the accelerator cord. The Viper 3 obviously has a SharkNose, developed and patented by Ozone. It wasn't around for the Viper 2.

The cell openings are very small and the fabric (Dominico 30D) is also fine. There are few reinforcements, which confirms that the Viper 3 is optimised to be light, slender and efficient! In fact, compared to the Viper 2, size 20 of this snake has slimmed down by 500 grammes.

TAKE OFF

Not much wind. With a fairly light 90 cc motor and an aspect ratio of 6, taking off facing the wing, it's impressive. It's majestic, slender and aesthetic – a real blade which makes its presence felt. I play a bit in the wind for a few seconds to see and immediately get the same feeling as with the Viper 1, in other words a very docile wing which goes where you want it to, without over reacting, hesitating or wrestling. It makes you feel as if you can do what you want with it, without any difficulty. I found it amazingly manoeuvrable; the brake travel is short and the controls are light. Straightaway you feel the typical Ozone signature in the brakes. Cool!

Off we go. I turn round and give it a bit of throttle; two and a half steps (maximum) later and I'm airborne. Way too easy! Wow, the air moves about a lot. With strong wind and a low base that's not so surprising. With a Top80 from when I had my Viper 1, it would have taken a while to climb. Here, with nearly the same configuration, I could be mistaken for the Ariane V space rocket, the climb rate is so amazing! I tell myself it's pretty pointless having a 200 cc motor under this type of wing, unless you're the size of a Normandy cow or want to do loops.

Photo: Lucille Pointeau Pilote: Sylvain Dupuis

"Wow! It's the first time I've seen a wing with so few lines!"

In the turn the Viper 3 responds immediately, without any effort at all. It turns cleanly, feels efficient, and loses very little altitude. The rolling pendular conversion is pretty gentle but present, as it is, in pitch elsewhere. When it's trimmed, you actually feel like you're under just a paraglider; the Viper 3 transmits the slightest bit of feedback about the air mass, through all the axes. In turbulent air, there is a small tendency to have a slight rolling pendular movement (right-left-right-left) with the trimmers on.

Speed: an average of 39 km/h trimmed with hands up. When opening the trimmers, there is a little surge and the Viper 3 stabilises at 49 km/h. As with all reflex wings, the profile seems less sensitive to the air mass. The pitch backwards and forwards are not as clean and in some ways, less visible. A bit more effort is required on the brakes, but the Viper 3 remains, all the same, very light and manoeuvrable. Like its Grandmother, the Viper 1, the 3 quickly takes up enormous amounts of energy, which it just wants to give back, especially when untrimmed. That can be a surprise! It still has the same light movement in the roll when you've got your hands up. A pull on the wing tip control and everything stops, nothing bad about that. I still can't feel any lack of power with this little 90 cc engine and an all up weight of 110 kg, even during tight turns near the ground! I almost feel as if I even have a surplus of unused power, which is quite amazing.

When slaloming, the Viper 3 is obviously not in its element. All the same, it works well, but the energy in the roll needs a lot more anticipation, finesse, precision and experience to be used judiciously.

Photo: Lucille Pointeau Pilote: Sylvain Dupuis

To counter the pitches backwards, you can use the accelerator as in slalom. This gives about 10 km/h and is by far the easiest to use out of all the wings that I have tried up until now. During all the test flights I only used it with one foot, without any problem!

60 km/h maximum speed, that's respectable but, at the same time, it's not in the same league as the slalom wings. Why?

Quite simply because, with a slalom wing, with the bar on max, you're on maximum throttle with your 30 HP motor, whilst on the Viper 3, I hardly used more than half the throttle with a 15 HP motor.

Some wingovers: They were big, slow, majestic, like on the Viper 1. But be careful you don't make mistakes.

The Viper 3 isn't an idiot-proof wing; it's a snake watching out for your every mistake and doesn't hesitate to bite when you get it wrong. In any case, the Viper 3 isn't a freestyle wing, just look at the length of the lines...

The wing of superlatives? The Viper 3 is by far the best performing wing that I have tried up until now. Made like a high performance paraglider, clocking up kilometres is its domain, with or without a motor and whether in a straight line or in thermals.

Economical, fast and easy to handle, that's what makes wings perform best today. But be careful, the Viper 3 is a viper. Lots of experience is essential.

The Viper 3: The first viper with a SharkNose. The fairly pronounced SharkNose is clearly visible.

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

Photo: Lucille Pointeau

The SharkNose on the Viper 3: the first version to have one.

Riser layout

Photo: Coco

VIPER 3 - TECHNICAL DATA

Manufacturer : OZONE - Mail : alixa@alixa.fr Tel : 04 92 81 03 62
Web : http://www.ozone.com

YEAR	2014	2014	2014	2014
SIZE	20	22	24	26
CELLS	62	62	62	62
FLAT SURFACE AREA [m²]	20	22	24	26
PROJECTED SURFACE AREA [m²]	17.1	18.8	20.5	22.2
FLAT WINGSPAN [m]	10.94	11.47	11.98	12.47
PROJECTED WINGSPAN [m]	8.72	9.14	9.55	9.94
FLAT ASPECT RATIO	6	6	6	6
PROJECTED ASPECT RATIO	4.45	4.45	4.45	4.45
ROOT CHORD [m]	2.31	2.42	2.53	2.63
ALL UP WEIGHT [kg]	65-85	75-95	85-105	95-115
ALL UP WEIGHT PPG [KG]	75-105	85-115	95-125	
WEIGHT OF THE WING [kg]	4.7	5.05	5.45	5.9
CERTIFICATION	DGAC			
PRICE [€]	3 940	3 980 €	4 030€	4 090 €

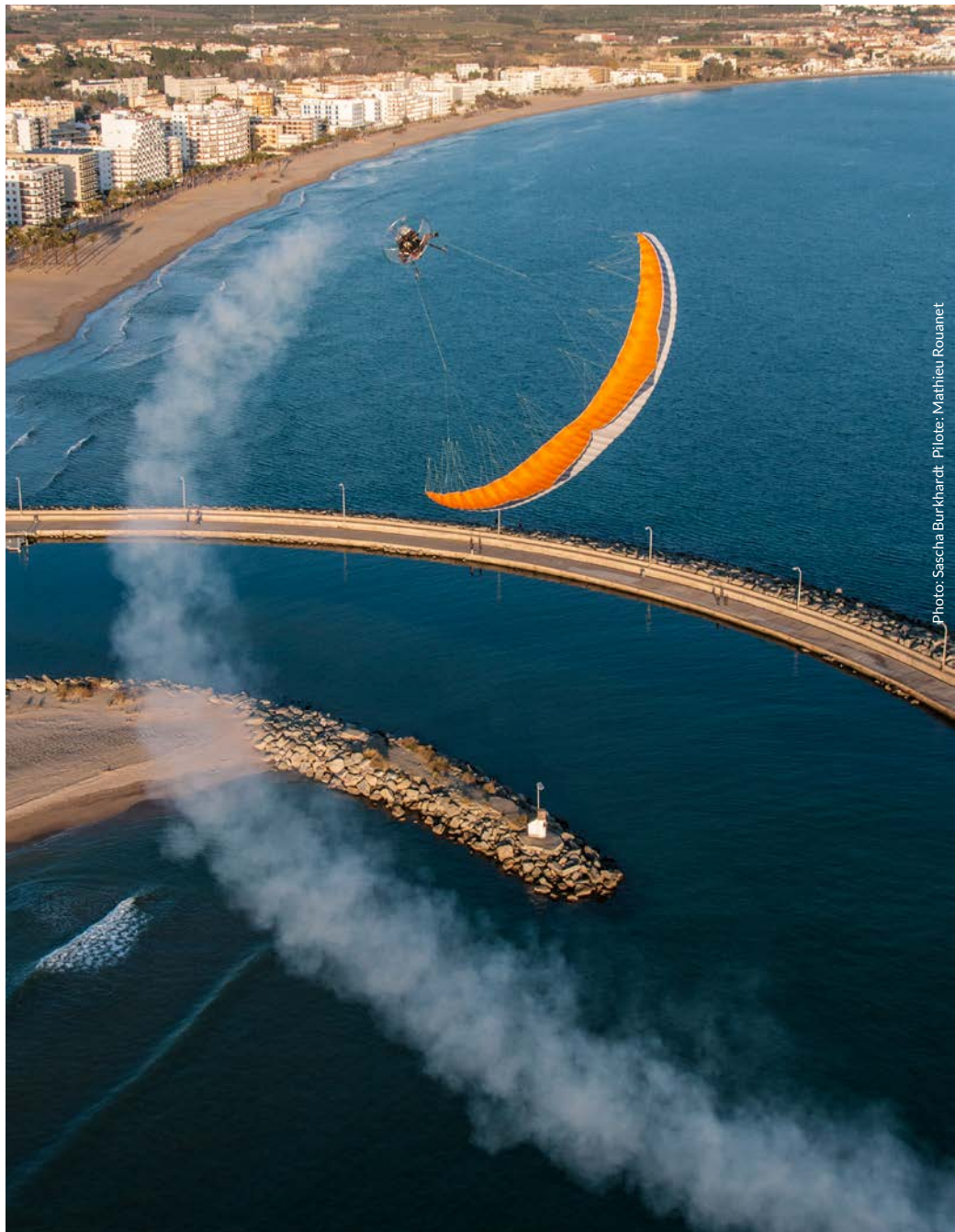


Photo: Sascha Burkhardt Pilote: Mathieu Rouanet

Mathieu Rouannet at the controls of a previous version of the Viper in 2011: a very 'paraglider' wing, manoeuvrable and reactive. This one was neither reflex, nor did it have a SharkNose.

DUDEK

SNAKE
VERSUS
SNAKE XX

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

Despite the appearance of a Snake XX with a SharkNose profile, the classic Snake remains current.

Sylvain Dupuis, our test pilot, tried it over a year ago. Here's his report followed by how he got on with the new version, the Snake XX…

Photo: Véronique Burkhardt Pilote: Sascha Burkhardt

INDEPTH

The Snake is made from the famous Dominico Tex, in 41 g/m² which inspires confidence as far as life expectancy is concerned. The risers are complex (there are lots of pulleys, straps and lines) and they're well made. It has the Power Attack system (Paap Kolar System), which allows the pilot to manage the angle of attack of the wing across the whole range just with the speed bar, as is the case on the Paramania GTR. Also present, the 2D steering system allows you to brake where you want: mainly at the wing tips when you are going very fast, mainly in the middle of the wing to tighten a turn.

GO !

For this first flight, the conditions are lenient, 20 km/h laminar wind and weak sunshine. My all up weight is 105 kg with a Kangook Thor 200 and the test wing is 20 m². With 20 km/h, the inflation is no problem. The Snake comes up quickly and settles above my head after a little pull on the brakes. Throttle, a little bit of brake and, in three steps, I'm airborne. The Snake is stable on all the axes, seeming well balanced. The climb rate with the Thor 200 is impressive, but the torque effect is weak, despite my low swing arms. This is a very good point!

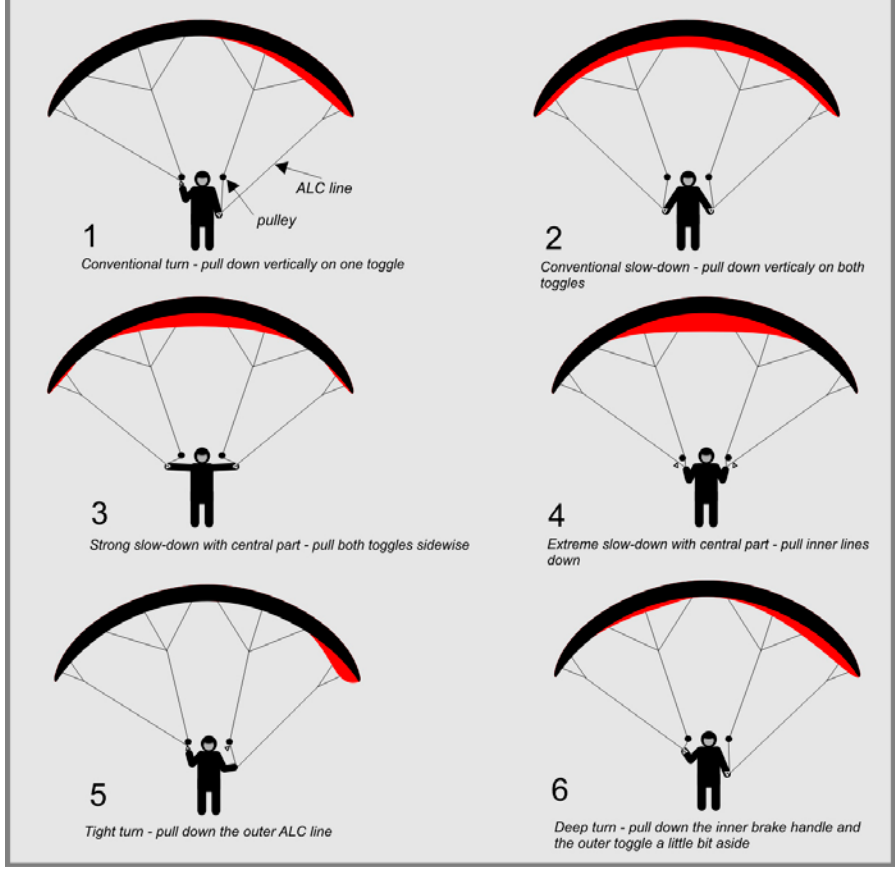
In the trimmed configuration, I can keep the same height with hardly any throttle for a 20 m². That's confirmed when I cut the throttle and go for minimum descent rate; the glide is excellent for this type of wing! Another point which needs to be noted and which can be as much an advantage as an inconvenience: the Snake is a fairly lively wing in turbulence.

A typical riser for an efficient reflex wing.

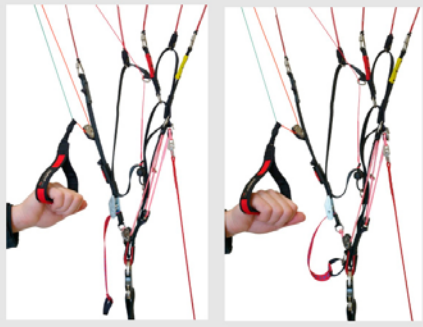
REMINDER
HOW DO STABILO STEERING SYSTEMS WORK?

Dudek were pioneers in complex piloting systems. Of course the Swing Minoa in 1993 already had a similar system, but it was thanks to the ALC (Alternative Steering System) perfected by Dudek that it became widely used by paramotor manufacturers. To understand it better, here's the 'flying instructions' from the Snake manual.

However, lots of pilots use the system the other way round, by passing the stabilo line through the pulley. Thus by moving your arms apart you pull more on the stabilo.



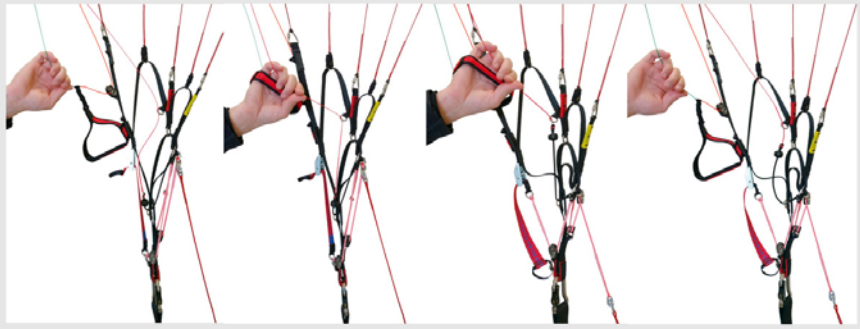
Various steering modes with PA activated and deactivated

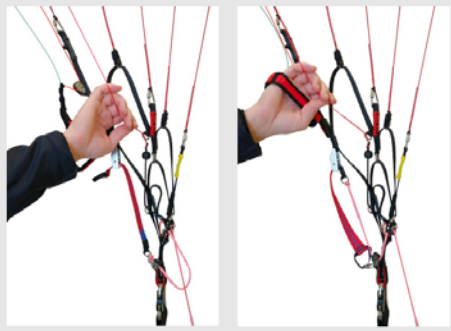


Steering with main brake toggles only (slow or accelerated mode)
The toggle has different effects when pulled down vs. away (details on next page).

Main toggle + outer ALC line (accelerated mode)
Variable steering progression depending on degree of operation.

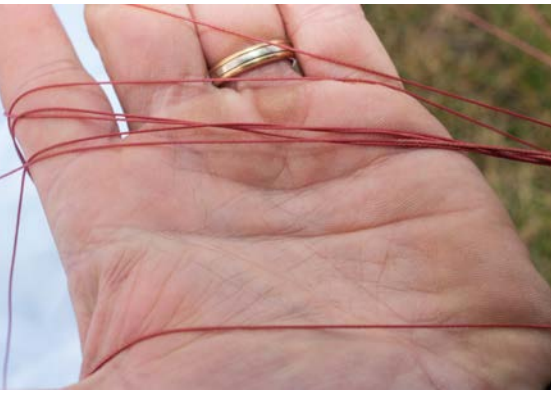
Steering with outer ALC line only (accelerated mode)
Main steering toggles can be docked on the magnets or let free.





Steering with TCL line (required in full speed mode):
- use the TCL line only (with main steering toggle still in hand or docked),
- below or above the metal ring (depending on hangpoints position).

The Snake works well with a trike too, here's a photo of Sascha with a Nirvana trike. Photo: Claudias Barat.



It gives lots of feedback about the air by moving on its roll, pitch and yaw axes, which is an undeniable advantage if you want to fly in thermals, but which can be fairly uncomfortable when cruising if you're not a fan of 'active piloting'. Here we're quite far away from a Dudek Nucléon for example, which filters everything. In a turn, and still trimmed, the Snake is both manoeuvrable and gentle. It isn't at all explosive, but more progressive and the effort required for the controls is quite low. On the other hand, when you're in a tight turn, the Snake seems to rather want to stay there. The turns are therefore very tight. The pitch backwards coming out of a trimmed turn is fairly large, making me think more of a paraglider than a full reflex wing.

LET'S DETRIM:

As on all reflex wings, the effect is immediate, the wing dives and you feel the wind increase a lot. So into a completely different flying zone we go! The wing stays flyable through the brakes in this configuration and the turns stay clean and efficient. The brakes are a bit stiffer, without needing to be physical.

The tendency to surge backwards after a tight turn is less here and it is more inclined to return to flying flat, without going the other way. With some turbulence, and still untrimmed the Snake is alive, just. There is no parasitic roll, so it remains fairly comfortable during long transitions.

The Snake 1: sophisticated stiffening thanks to Mylar and leading edge rods, but no SharkNose.

Despite everything, it remains fairly communicative about the state of the air; you know about any turbulence that you are crossing.

Close to the ground, the Snake remains very precise and you can play around between the main brakes and the wing tip controls.

AND BACKWARDS?

I put the trimmers on and keep full throttle on up to 500 m of altitude. The Snake will go into a SAT no problem, without collapsing and without deforming. On the other hand, as on the wing tested, the loops are too small to go over your hands, I was therefore 10 cm of brake travel short. The SAT thus remained fairly flat and turned very fast; it was pretty physical and uncomfortable.

I came out of it and decided to try again, but this time holding the brake where it was attached to the line, to save these 10 cm. The manoeuvre remained fast with lots of centrifuge, but it was better!

The Dudek stuff sack is very practical

The brakes need to be adjusted to be at their shortest and have handles adapted for doing acro. Coming out of the SAT, I go straight into a series of wingovers. Back to the sensation of being on more of a paragliding wing, where you have to carefully combine weight shift and the controls if you want to have good amplitude. The Snake therefore needs to be flown with precision! When they have a good rhythm, the wingovers are pretty big, rather slow and very aesthetic! Watch out though, that you aren't late with the timing. It has a fairly moderate roll and a pretty large pitch, so if there is a large error this lapse will get you!

On the other hand, this strong pitch allows a fairly easy and aesthetic Powerloop! As for barrel rolls, they aren't the Snake's speciality, once again due to its fairly moderate roll. At the end of the day, the Snake is a lot less disposed to Speed-Flying than some of its rivals.

SO LET'S GO FOR IT?

For the next flight there is no wind! I take off with my back to the wing; it comes up impeccably and the load take up is very quick, amazing for a 20m² with a reflex profile!

In detail, the reinforcements as well as the replaceable leading edge rods. Right: looking inside the Snake 1.

Photo: Lucille Pointeau Pilote: Sylvain Dupuis

With the speedbar on maximum, the wing surges and makes you understand that this isn't playing anymore. Or maybe it is: 'do you want to play? 'Ok! Let's play!'.

First observation, it flies straight, and that's really cool! Despite the substantial increase in power, the Snake stays on course and you don't feel very much of the devilish torque of the 30 HP motor! I make little changes to the course with the wing tip controls attached to the brakes. It's amazingly efficient!

One thing to remember: don't use the main brakes in this configuration, you'll hit the deck, but I can't teach you anything if you're good enough to fly a Snake! With full bar 1 m from the ground, the speed is impressive, no time to look at the scenery. The wind sock on the ground serves as a pylon. I damp my turn with the wing tip, then release the bar completely and, with no further ado, go into a tight turn giving it full throttle. Here, all the energy accumulated in the speed is converted into the pitch backwards during the turn, pitch which I amplify by crushing the central brakes to tighten the turn even further. The result is compelling: the turn is very quick, energetic, extremely tight and on the edge!

> *ON FULL BAR 1 M FROM THE GROUND, THE SPEED IS IMPRESSIVE; NO TIME TO LOOK AT THE SCENERY.*

SNAKE - TECHNICAL DATA					
Manufacturer : DUDEK - Web : www.dudek.eu					
TEST PILOT	Pjotr Dudek				
SIZE	16	18	20	22	24
CELLS	58	58	58	58	58
ALL UP WEIGHT [kg]	50-105	55-120	60-130	75-145	90-160
FLAT SURFACE AREA [m²]	16	18	20	22	24
PROJECTED SURFACE AREA [m²]	13.93	15.67	17.41	19.16	20.90
FLAT WINGSPAN [m]	9.63	10.22	10.77	11.30	11.80
PROJECTED WINGSPAN [m]	7.88	8.36	8.81	9.24	9.65
FLAT ASPECT RATIO	5.80	5.80	5.80	5.80	5.80
PROJECTED ASPECT RATIO	4.46	4.46	4.46	4.46	4.46
WEIGHT OF THE WING [kg]	4.6	4.9	5.6	5.8	6.2
PRICE [€]	3300				
CERTIFICATION DGAC	Oui	Oui	Oui	Oui	Oui
MATERIAL	Dominico Tex 34/41g / Dom Tex Hard 41 g SR Scrimm SR Laminate 180 g				

There are two solutions for exiting such a powerful turn cleanly: reduce the throttle (not great!) or push the bar to get going again (a lot better!). I choose the bar option which counters the pitch backwards, whilst compensating for the roll with the wing tip control. It's very precise and like being on rails!

CONCLUSION :
Being used to wings which are livelier, more explosive and indeed more fun, I admit to still feeling a bit hungry as far as the acrobatic and playful potential of the Snake is concerned. It doesn't have the 'Speed flying wing' trend of being fun in every way and in all conditions, able to do no matter what, with no problem at all!

On the other hand, purely from a performance point of view, the Snake is a very thorough wing. For me, it revealed its real potential when flying at full speed on full bar: precision, speed, manoeuvrability and balanced on its axes.

It is one of the most appealing wings for those who want to gain time during pylon tasks. Its low consumption makes it flexible. Of course, it isn't a wing to give to just anyone. A lot of experience is required to manage its speed, energy and reactions.

It isn't a wing which can be left to do everything when the conditions aren't so great nor will it let piloting errors during committing manoeuvres go unnoticed. But for all that, it still remains a very safe wing whose reactions can be fairly easily anticipated, in short, it's a competition wing. If you're an experienced pilot and you're looking for absolute performance rather than the fun factor, the Snake is probably made for you. Try it!

If you're looking for a more flexible wing, less geared towards slalom competitions, try the Hadron XX from the same manufacturer.

DUDEK SNAKE XX

The Snake XX is a new version of the snake. It has a new profile and behaves quite differently.

Dudek celebrated their twentieth anniversary in 2015. For this landmark birthday they launched the XX series ('XX' standing for 20). The evolution isn't just in the colours but also in the conception of the wings, which has profoundly changed.

Like all the XXs, the Snake XX has a new profile and it's equipped, amongst other things, with SharkNose technology. The air inlets in the cells seem microscopic, which is a gauge of the reduction in drag and thus a gain in performance. In the same vein, the volume of the lines has been reduced. The Snake XX is obviously equipped with the PK system which was first used by Paramania on the GTR. This system allows the angle of attack of the wing to be managed by the bar across its whole range (the trimmers release when the speed bar is used), which is really handy during slalom.

As on the Snake, the XX was equipped right from the beginning with a mounting for the wing tip control on the main brake. So the same brake handle can be used by choice to manage the brakes or the wing tip. The wing in this test, which belongs to Yann Leudière, has been modified according to his preferences: he has inverted the brake system by passing the TST (tip control line) through the pulley rather than the brake line! With this modification, to pull on a wing tip, all you have to do is move your arms apart, whilst to brake the whole trailing edge, all you have to do is brake normally along the riser, like on any other wing.

Conditions during the test: light southerly wind but turbulent in the lee of the relief.

An easy inflation with the load take up excellent for a 16 m². My PA125 was amply sufficient to pull me off the ground after just a few steps with the breeze helping. The climb rate is generally better than that of my prototype GTR of the same size. The Snake XX is happy with just a little bit of motor to fly within the low speed ranges.

On the other hand, I note a nice tendency for pitch instability. In fact, as would any non reflex paraglider wing, the XX has a tendency to give feedback on any movements of the air.

A front on gust leads automatically to a surge backwards. You feel this effect a little less when the wing is untrimmed or accelerated. It isn't comfortable when cruising (a bit like the GTR and its roll) because you yoyo when the conditions are a bit turbulent. But the Snake XX isn't made for cruising. Its preferred playground is a lot lower: at ground level! PK system plugged in, I push the bar to the floor and rev the motor to compensate for the sink rate which has become impressive! It rocks!

The difference between minimum and maximum speed is very substantial. In fact, even if the Snake XX figures today amongst the fastest wings on the market, where it cuts a real difference with its competitors is its minimum speed.

When you release the bar in one go, you find yourself sent into orbit. All the energy accumulated in the speed converts into climb and thus into pitch and this into energy to tighten the turn.

This potential difference in speed is the most efficient weapon on a pylon course. You're as fast as your competitors in the straight sections, but when approaching the pylon and after having initiated a roll thanks to the wing tip, you release the bar and plant the brakes. You'll thus feel as if you've been catapulted round the pylon, having done a U-turn in no time!


Lojak - http://www.lojak.pl


Lojak - http://www.lojak.pl

Going back on to the bar at the right time will eliminate the residual pitch movement when attacking the next straight. That's where this Snake XX's real strength lies: its capacity to maintain the turn nearest to the pylon without increasing or decreasing the trajectory, and whilst remaining a very fast wing during the straight. Usually these two attributes are fairly opposite. I climb a bit to do a series of wingovers. Careful how you manage the energy with this wing. With its substantial pitch, it's easy to find yourself in difficult situations in the case of any timing error or slight hesitation. If you know how, it can get very high with little momentum.

CONCLUSION :
A little devil! For slalom, I think that the Snake XX is the ultimate weapon today because it performs well at speed and in the turn. Careful though, I said 'devil' and if the Snake remains an accessible wing for very good pilots, the Snake XX is intended for competition pilots who have a lot of flying experience, and only for them. Pilot errors or corrections during manoeuvres are not permissible and don't count on it to 'pick up the pieces' in turbulent conditions. Control its movements and surges delicately but firmly, or you risk it all going to worms. So if you're looking for a high performance wing for flying on the weekend with friends, look elsewhere because there are lots of other more suitable wings. If on the other hand, you have nerves of steel during slalom competitions, you're a good pilot and at ease in all conditions, then the Snake XX is a really efficient weapon!

SNAKE XX- TECHNICAL DATA

Manufacturer : Dudek **Mail :** info@dudek.fr
Web : http://www.dudek.fr

SIZE	15	16	18	20	22
CELLS	60	60	60	60	60
FLAT SURFACE AREA [m²]	15.00	16.00	18.00	20.00	22.00
PROJECTED SURFACE AREA [m²]	12.94	13.81	15.53	17.26	18.98
FLAT WINGSPAN [m]	9.40	9.71	10.30	10.86	11.39
PROJECTED WINGSPAN [m]	7.62	7.86	8.34	8.79	9.22
FLAT ASPECT RATIO	5.90	5.90	5.90	5.90	5.90
STRECKUNG PROJIZIERT	4.48	4.48	4.48	4.48	4.48
HEIGHT OF LINES [m]	5.64	5.83	6.18	6.52	6.83
LENGTH OF LINES [m]	251.41	260	276.43	291.96	306.74
ALL UP WEIGHT [kg]	90-135	95-145	110-150	120-160	130-170
HOMOLOGATION MOTEUR	DGAC en cours				
MATERIAL	Porcher Sport 38 g/m2 / Dominico tex 34 g/m2 / Porcher Sport Hard 40 g/m2 / SR Scrim / SR Laminate 180g				
PRICE [€]	3 450	3500	3550	3600	3600

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DEUTSCHER HÄNGEGLEITERVERBAND E.V.		WW.DHV.DE
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LEKI LENHART GMBH		WWW.LEKI.DE
MOTORSCHIRM-FLUGCENTER-AUMÜLLER		WWW.MOTORSCHIRM-FLUGCENTER.DE

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UP INTERNATIONAL GMBH		WWW.UP-PARAGLIDERS.COM
VONBLON	AUSTRIA	WWW.VONBLON.COM
WESPOT GBR		WWW.WESPOT.DE
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