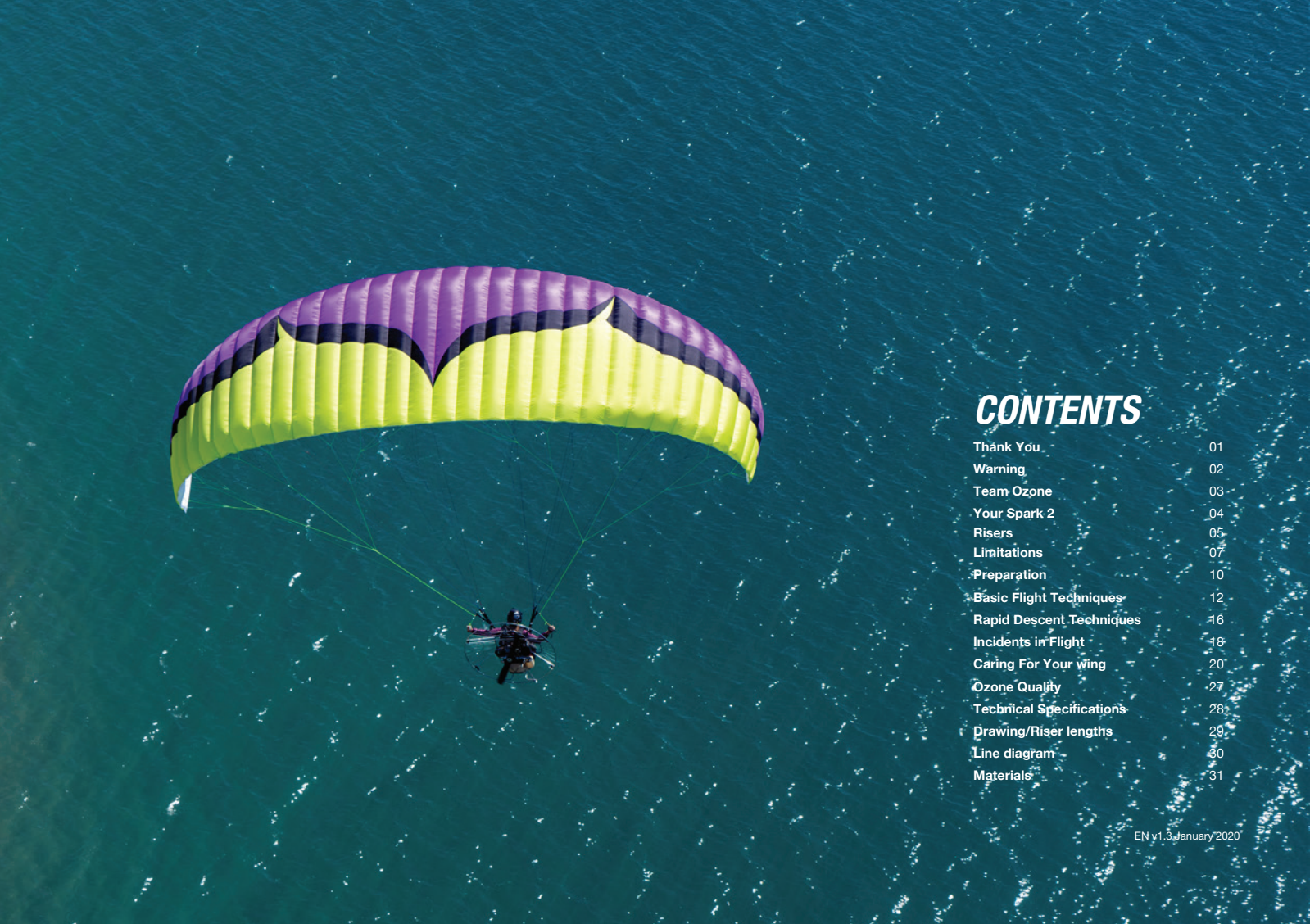
Spark 2

Pilots Manual



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THANK YOU

Thank you for choosing to fly Ozone. As a team of free flying enthusiasts, competitors and adventurers, Ozone's mission is to build agile paragliders of the highest quality with cutting edge designs, performance and maximum security.

Confidence and belief in your paraglider is a far greater asset than any small gains in performance - ask any of the Ozone pilots on your local hills, or those who have taken our gliders on ground-breaking adventures or stood on podiums around the world. All our research and development is concentrated on creating the best handling/performance characteristics possible with optimum security. Our development team is based in the south of France. This area - which includes the sites of Gourdon, Monaco and Col de Bleyne - guarantees us more than 300 flyable days per year, this is a great asset in the development of the Ozone range.

As pilots we fully understand just how big an investment a new paraglider is. We know that quality and value for money are essential considerations when choosing a new wing, so to keep costs low and quality high we manufacture all of our products in our own production facility. During production our wings undergo numerous rigorous quality control checks that are fully traceable, this way we can guarantee that all of our paragliders meet the same high standards.

This manual will help you get the most out of your glider, it is essential that you read it before flying your new wing for the first time. Its details the procedure for preparing the wing before flight, basic flying techniques and also includes tips and advice on how best to care and maintain your wing to ensure a long life and high resale value. For the latest updates, including all technical data please refer to the online version. This can be found on the product's page at www.flyozone.com

If you need any further information about any of our products please check flyozone.com or contact your local dealer, school or any of us here at Ozone.

Safe Flying!
Team Ozone

WARNING

- Paragliding/Paramotoring is a potentially dangerous sport that can cause serious injury including bodily harm, paralysis and death. Flying an Ozone paraglider is undertaken with the full knowledge of the involved risks.
- As the owner of an Ozone paraglider you take exclusive responsibility for all risks associated with its use. Inappropriate use and or abuse of your equipment will increase these risks.
- Any liability claims resulting from use of this product towards the manufacturer, distributor or dealers are excluded.
- Be prepared to practice as much as you can - especially ground handling, as this is a critical aspect of paragliding. Poor control while on the ground is one of the most common causes of accidents.
- Be ready to continue your learning by attending advanced courses to follow the evolution of our sport, as techniques and materials keep improving.
- Use only certified paragliders, harnesses with protector and reserve parachutes that are free from modification, and use them only within their certified weight ranges. Please remember that flying a glider outside its certified configuration may jeopardise any insurance (e.g. liability, life etc) you have. It is your responsibility as the pilot to verify your insurance cover.
- Make sure you complete a thorough daily and preflight inspection of all of your equipment. Never attempt flying with unsuitable or damaged equipment.
- Always wear a helmet, gloves and boots.
- All pilots should have the appropriate level of license for their respective country and third party insurance.
- Make sure that you are physically and mentally healthy before flying.
- Choose the correct wing, harness and conditions for your level of experience.
- Pay special attention to the terrain you will be flying and the weather conditions before you launch. If you are unsure do not fly, and always add a large safety margin to all your decisions.
- **NEVER fly your glider in rain, snow, strong wind, clouds or turbulent weather conditions.**
- If you use good, safe judgment you will enjoy many years of paragliding/paramotoring.

TEAM OZONE

Everyone at Ozone continues to be driven by our passion for flying, our love of adventure and our quest to see Ozone's paraglider development create better, safer and more versatile paragliders.

The design team consists of David Dagault, Luc Armant, Fred Pieri, Russell Ogden, Honorin Hamard, Emilia Plak and Alex Mateos. Dav has a wealth of experience in competition flying, XC, XAlps and paraglider design. Luc, a dedicated XC and competition addict has a background in naval architecture. Fred, our resident geek is a mathematician, mechanical engineer and vol Biv specialist. Russ is a competition pilot and test pilot with 1000s of hours testing experience. Honorin has been flying since he was 13, naturally talented, he has already become world champion. Between them, they bring a wealth of knowledge, ideas and experience and work closely together in the design and testing process.

Former female World champion, Emilia Plak manages the paramotor department, she is helped by Alex Mateos. As two of the finest pilots in the world holding World, European and French Paramotoring champion titles between them, they offer valuable advice and feedback throughout the development process, helping to produce the perfect blend of safety, speed and performance.

Mike Cavanagh is the boss and multiple winner of the UK XC league, when not out flying he generally keeps control of the mayhem. He is helped by Jean Christophe Skiera (JC) who manages our distribution network and the product range. Promotion and marketing are coordinated by BASE jumping legend Matt Gerdes. Back in the office Karine Marconi, Chloe Vila and Isabelle Martinez run the show. These wonderful ladies look after the ordering system, the dealers, the design team and the general day to day running of the company - without them it would be chaos.

Our own manufacturing facility in Vietnam is headed up by Dr Dave Pilkington who works relentlessly manufacturing gliders and producing prototypes as well as researching materials and manufacturing processes for our future products. He is backed up by a superb team managed by Khanh and Phong with over 1000 production staff.

YOUR SPARK 2

The Spark 2 is a PPG wing designed specifically for schools and beginner pilots. Based on the Element 3, the Spark 2 is an incredibly easy and forgiving wing ideal for all levels of student training. The Spark 2 features technologies taken from our higher performance models but implemented into a concept focused very much towards, safety, forgiveness and excellent inflation behaviour. The new profile, line layout and internal structure improves the efficiency and passive safety whilst retaining the forgiving nature required for a school wing. The planform retains a moderated aspect ratio which has proven to be a good compromise for comfort, ease of use and fun whilst maintaining exceptional safety characteristics.

Particular attention has been made to the inflation behaviour and ground-handling characteristics to make powered launches as easy as they can be. In nil-wind conditions, the inflation is incredibly easy, the Spark 2 inflates with the lightest of forward pressure, yet the leading edge remains strong and open even when forced by heavy inputs. In the lightest of winds, the Spark 2 rests overhead and forgives misguided inputs, this quality makes ground handling both fun and safe.

In the air, the Spark 2 is simple to fly. It is damped in both roll and pitch, with a progressive feel in the brakes for controlled and coordinated turns. The overall brake range is long, with a very slow stall speed, making it very difficult for students to inadvertently stall or spin the wing. Whilst the it is incredibly forgiving, the Spark 2 is also enjoyable to fly, tight and compact in the air, beginners will find it intuitive to fly whilst instructors will appreciate handling that is agile and precise. The excellent sink rate performance allows for quick take offs and efficient fuel consumption.

The Spark 2 is available in 3 sizes, covering a wide weight range of pilot weights. The overall ease of use and uncompromising safety combine to make the Spark 2 the favoured workhorse for instructors and schools.

RISERS

The Spark 2 has been designed with 3 risers per side. They are simple and uncluttered with an effective trimmer and short-range accelerator system offering sufficient speed and solidity. The A risers are covered with coloured webbing allowing for easy identification and split into two; the smaller riser - holding only the outermost A line makes applying big ears simple.

For easy high speed cruising the Spark 2 is delivered with trim risers as standard. It shares the same top speed as the Element 3, splitting the acceleration between the trimmers and the foot operated speed system. Because of this, as delivered the wing does not conform to the EN 926.2 standard. Fully certified Element 3 risers are available for the Spark 2. Please consult with your dealer.

Trimmers

The risers feature trimmers for comfortable fast cruising whilst under power. The standard setting is with the trimmers pulled all the way down to the slowest position. The wing has been EN flight tested with the trimmers set in the slow position and with the use of the foot operated speed system. Flying outside of the certified weight range or releasing the trimmers invalidates any EN flight certification. The trimmers can be locked to the carabiner in the standard position using the D ring, but doing so will restrict the maximum top speed of the wing.

The standard trim setting is recommended for take off, landing, climbing under power, whilst thermalling or free flying and when the air is turbulent. Brake pressure is lighter and the handling at its best at the standard trim setting.

To increase cruise speed you can use the accelerator system, release the trimmers, or do both - but only do so when the conditions are suitable.

In turbulent air the profile is stable, it will resist reasonable levels of turbulence with a high resistance to collapse without pilot input. However in turbulent air Ozone recommends to return the trimmers to the standard position (pulled down) and to fly the glider actively. This way, you will be in the best position to react correctly should an incident occur.

NOTE: The standard or neutral position of the risers is when the trimmers are pulled down to the slowest position. In this position the maillons on the risers are level.

IMPORTANT

This wing has passed the criteria required by the DGAC and has been load tested to the EN 926.1 standard. In addition to our own extensive testing, it has also been independently flight tested to the EN 926.2 standard with the trimmers set to the slow position. Releasing the trimmers, or flying outside of the EN certified weight range invalidates any EN flight certification.

Speed System

The risers feature a foot operated accelerator system for high speed cruising. The speed system acts differently than releasing the trimmers, but either can be used in any combination to accelerate the wing. Be careful, fully accelerated with the trimmers released is fast and should only be used in calm conditions and with sufficient altitude.

Brake Lines

The brake line lengths have been set carefully during testing. We feel it is better to have slightly long brake lines and to fly with a wrap (one turn of line around the hand). However, if you do choose to adjust their length please keep in mind the following:

- Ensure both main brake lines are of equal length.
- If a brake handle has been removed, check that its line is routed through the pulley when it is replaced.
- When the brakes are fully released in flight, the brake lines should be slack. There must be a substantial bow in them to guarantee no deformation of the trailing edge when accelerated.
- There must be a minimum of 10cm of free play before the brakes begin to deform the trailing edge. This prevents the trailing edge from being deformed when using the speed system.

Adjustable brake handle height

The height of the brake handles can be adjusted according to pilot preference to suite the power unit's hang points height by using the appropriate pulley. There are 2 pulley settings: upper and lower. The upper setting (as set by the factory) is for low hang point motors whilst the lower setting is for units with higher hang points.

If you lower the brake handle, you must also lengthen the brake lines accordingly. Moving the brake handles to the lower pulley requires adding 17cm to the overall brake line length - use the appropriate mark on the brake lines.

- First undo the brake handle's knot and remove the brake line from the upper pulley.
- Re-route the brake line through the lower pulley
- Re-attach the brake handle with an appropriate knot at the correct length using the second mark.

IMPORTANT

Using the accelerator or releasing the trimmers decreases the angle of attack and makes the wing more prone to collapse, therefore accelerating the wing near to the ground or in turbulent conditions should be avoided.

IMPORTANT

In the unlikely event of a brake line snapping in flight, or a handle becoming detached, the glider can be flown by gently pulling the rear risers for directional control.

IMPORTANT

If you adjust the brake handle height, you MUST re-lengthen the brake lines accordingly.

Pilot Suitability

The Spark 2 has been designed as a solo beginner/intermediate level wing. Due to it's forgiving nature it is also suitable for all levels of training. It is not intended for tandem flights nor aerobatic manoeuvres.

Certification

This wing has passed the criteria required by the DGAC and has been load tested to the EN 926.1 standard. In addition to our own extensive testing, it has also been independently flight tested to the EN 926.2 standard with the use of the accelerator system, but with the trimmers set to the slow position only. Releasing the trimmers, or flying outside of the EN certified weight range invalidates any EN flight certification. As delivered, the wing does not conform to the EN 926.2 standard due to the inclusion of the trimmer risers.

Choosing Your Wing Size

The most suitable size wing for you depends on how you intend to use it. If you will be flying solely with a motor, aim for the middle of the PPG weight range (all up weight with wing, motor, fuel etc). However if you intend to also free fly with the wing, consider your all up free flying weight and aim to be near the top of the PG weight range.
Never fly above the recommended maximum PPG weight.

Wing Loading and Flight Characteristics

Wing loading has a significant effect on the flight characteristics and behavior of the wing. Heavily loaded, the Spark 2 is more responsive to pilot inputs and reacts more dynamically in turns with a greater loss of height. Recovery from collapses tend to be more impulsive and with higher pitch angles. High loading also makes the wing more likely to remain neutral in a spiral dive, especially when combined with a high hang point or trike power unit. Flying at the maximum recommended load is only suitable for more experienced pilots who have the necessary skills to control a more dynamic wing. High G rapid descent manoeuvres should be avoided when flying above the maximum recommended EN weight or when flying with a trike or high hang point harness. We advise you to aim for near the top of the recommended EN weight range for free flying and to never fly above Ozone's recommended PPG weight range whilst under power.

IMPORTANT
The Spark 2 is certified EN A with the accelerator, but with the trimmers set to the slow position. Releasing the trimmers, or flying outside of the certified weight range invalidates EN flight certification.

Load test and wing loading information for PPG wings

To verify the structural strength of a paraglider or paramotor wing, the larger sizes of each model are subjected to the EN 926.1 load test. This test is comprised of two parts; a static shock test, and a sustained load test. First, using at least a 1000 kg weak link (higher for tandems) the wing must survive a brutal static shock test without any visible signs of damage to the lines or sail. The same wing then performs a sustained load test, inflated and pulled along a runway by a large truck until a three second average value of 8G is achieved without breaking. 8G is the minimum accepted load factor for EN certification, calculated by 8x the maximum permitted EN weight.

In addition to EN 926.1 our paramotor wings are also recognised by the DGAC, an entity responsible for Microlight (ULM) and lightweight powered aircraft (Paramotor) certification in France. Using the EN load test results, the DGAC accepts 5.25G as the maximum acceptable load factor. Both the 8G EN and 5.25G DGAC values, along with the recommended PG (free flight) and PPG (powered) weight ranges are indicated in the specifications for your reference.
We consider the DGAC load factor limit of 5.25G acceptable for “normal” PPG use - circuit flying, XC, adventure flying, Slalom racing, wing overs etc. Some rapid descent maneuvers fit into the “normal” definition: spiral dives with descent rates of ~10m/s are considered generally safe.

However, in our testing at Ozone we have recorded loads of up to 5.25G during fully engaged, nose-down spiral dives, at all parts of the weight range. Theoretically, it should not be possible to break a wing whilst flying at the maximum PPG weight of the larger sizes (smaller wing sizes have an inherent safety margin due to the fact that the same number & type of lines carry a lower max weight), but when you consider:

a) the natural weakening of lines with age;
b) the potential of accidentally damaged lines during normal use;
c) and that during a spiral dive or other aggressive acrobatic manoeuvre the load is not distributed as evenly across the span as it is during a physical test;

there is significantly less structural safety margin in when flying close to the maximum DGAC weight.
For this reason, our recommendation to all PPG pilots when flying at high wing loadings (above the middle of the recommended PPG weight range) is to not perform deeply engaged nose down, high-G spirals and other aggressive aerobatic manoeuvres. Doing so poses a real risk of line failure with potentially fatal consequences.

IMPORTANT
Do not perform high G spiral dives when flying above the maximum EN weight range or when flying with a trike or a high hang point harness

Trike Flying

The Spark 2 may be used with a light solo trike so long as the maximum recommended weight range is respected. It is strongly recommended to not perform deeply engaged, high sink rate spirals when flying with a trike.

IMPORTANT
It is strongly recommended to not perform deeply engaged, high sink rate spirals when flying with a trike.

Towing

The Spark 2 may be tow-launched. It is the pilot's responsibility to use suitable harness attachments and release mechanisms and to ensure that they are correctly trained on the equipment and system employed. All tow pilots should be qualified to tow, use a qualified tow operator with proper, certified equipment, and make sure all towing regulations are observed.

Flying in the Rain

Modern wings are susceptible to rain and moisture, flying with a wet wing can result in the loss of normal flight. Due to the efficient, wrinkle-free design of the sail, water tends to bead on the leading edge causing flow separation. Flow separation will make the wing more prone to entering inadvertent parachutal stalls, so flying in the rain, or with a wet wing (e.g early morning dew) should be avoided at all costs. If you are accidently caught-out in a rain shower, it is best to land immediately. If your wing becomes wet in the air it is advised to maintain accelerated flight using the speed bar and/or releasing the trimmers, even during the final approach. DO NOT use big ears as a descent technique, big ears increases drag, and with a wet wing this will further increase the chances of a parachutal stall occurring. Instead, lose height with gentle 360's and maintain your air speed at all times. If your wing enters parachutal stall when wet, immediately release the trimmers and accelerate the wing to regain airspeed.

IMPORTANT
Do not fly your wing when it is wet.

Modifications

Your Ozone Spark 2 was designed and trimmed to give the optimum balance of performance, handling and safety. Any modification voids the certification and will also make the wing more difficult and dangerous to fly. For these reasons, we strongly recommend that you do not modify your glider in any way.

Accelerator System

To set up the accelerator system, first route the lines supplied with the speed system through the harness. Make sure this is done correctly and that the lines pass through all of the pulleys (check your harness manual for instructions). Attach the speed system lines to the accelerator system on the risers with the Brummel hooks.

A basic set-up can be performed on the ground: ask a friend to pull the risers tight into their in-flight position whilst you sit in the harness on the ground. Now adjust the lengths of the lines so that the main bar sits just beneath your seat. You should be able to hook your heel in to the lower loop of the accelerator. There must be enough slack in the speed bar to ensure the front risers are not pulled down in normal trim speed flight, but not so long that it is impossible to use the full speed range of the glider. Fully extending the lower loop will accelerate the wing to approximately half its accelerated speed range. For full speed, hook your heels on to the upper bar and smoothly extend your legs, maximum speed is when the pulleys on the risers touch. Once set up, test the full range of the accelerator in calm flying conditions and ensure that both risers are pulled evenly during operation. Fine-tuning can be completed when you are back on the ground.

Harness and Motor

It will be in your harness that you will enjoy flying. Therefore, we recommend you spend the time on the ground to adjust your harness' different settings. Hang from a solid beam and double check that you are comfortable and that you can reach the brake handles and that you can achieve the full range of speed bar travel before flying. Do not fly with your chest strap set too tight.

The Spark 2 is suitable for all types of power units, however we recommend using units with low hang points or Goose neck systems. Using power units with high hang points is possible, but it will have a detrimental effect on the behaviour of the wing especially during spiral dives with an increased risk of neutrality. Using a harness that does not conform to the dimensions required of the EN standard or flying with a power unit will lead to a change in the flight characteristics.

There are many different motor units available and it is vitally important that you choose one that is suitable for your needs, weight and skill level. Due to the high performance profile of the Spark 2, a unit with a less powerful motor and low movable hang points may be advisable.

IMPORTANT
The wing has been certified with defined harness dimensions. The 30 was certified with the hangpoint width at 48cm, the 27 at 46cm and the 25 at 44cm.

Wing

To familiarise yourself with the glider it is a good idea to perform practice inflations and ground handling both with and without the motor. As with all new equipment, only fly in conditions that you would normally fly in and on a familiar site. Fly the wing in a progressive manner and be aware that wing loading has a direct effect on the wing's flying characteristics.

Preflight Checks

Lay out the wing downwind of your motor on its top surface in a pronounced arc, with the centre of the wing higher than the tips. As you unfold the wing check the upper and lower panels for any rips or tears, pay particular attention to the seams and line attachment points as these are load bearing. Never fly with a damaged wing.

Lay out the lines one side at a time and check for any obvious signs of damage. Hold the risers clear of the ground at shoulder height and starting with the brake lines, pull all lines clear. Repeat the process with the D, C, B and then the A lines, laying the checked lines on top of the previous set. Make sure no lines are tangled, knotted or snagged then mirror the process on the other side.

Take-off checklist:

1. Check reserve parachute - pin in and handle secure
2. Helmet on and fastened
3. All harness buckles closed - check leg-loops again
4. Carabiners and maillons tight
5. Holding the A's, your brake handles and throttle
6. Leading edge open
7. Aligned directly into wind
8. Engine warm and able to deliver full power
9. Trim set correctly
10. Prop clear of lines
11. Airspace and visibility clear

Launching

Your Spark 2 will launch with either the forward or reverse technique. The wing should be laid out in a pronounced arc, with the centre of the wing higher than the tips.

Forward Launch - Nil to Light winds

When the wind is favourable, whilst gently holding the A risers move forward positively, your lines should become tight within one or two steps and the Spark 2 will immediately start to inflate. You should maintain a constant pressure on the risers until the wing is overhead. Do not pull down or push the risers forward excessively, or the leading edge will deform and possibly collapse making taking-off more difficult and potentially dangerous.

IMPORTANT
Never take off with a glider that is not fully inflated or if you are not in control of the pitch/roll of your wing.

Move smoothly throughout the entire launch, there is no need to rush or snatch at it. You should have plenty of time to look up and check your canopy before committing yourself. Once you are happy that the Spark 2 is inflated correctly, accelerate smoothly off the launch.

Reverse Launch - Light to Strong Winds

Lay out your wing as you would for the forward launch. However, this time turn to face it, passing one entire set of risers over your head as you turn. Now you can inflate the glider with your body weight and the A-risers. Once the wing is overhead, release the risers, brake gently if necessary, turn and launch.

In stronger winds, be prepared to take a few steps towards the glider as it inflates. This will take some of the energy out of the glider and it will be less likely to overfly you. This reverse-launch technique can be used in surprisingly light winds too.

IMPORTANT
Always keep hold of your brakes. Do not fly in turbulent conditions

Practice ground handling as much as possible! Not only is it great fun, but it will give you a much better feel for your wing's flight characteristics. It will also improve your overall enjoyment of flying by giving you the feeling of control and making your launches easier and less stressful.

The Climb Out

Once in the air you should continue flying into wind whilst gaining height. Do not attempt to climb too steeply or too quickly by using the brakes or slow trim. The wing already has a high angle of attitude, coupled with a higher AoA (if you use the brakes) plus the engine's full thrust acting on the pilot, this could contribute to make the glider more prone to stall. Furthermore, in the event of an engine failure the resulting backward pendulum motion of the pilot and the forward dive of the wing may bring you back to

the ground very hard. Do not initiate turns until you have sufficient height and airspeed. Avoid low turns downwind with insufficient airspeed.

The Spark 2 is well damped in roll but under certain circumstances it is possible for the pilot to induce oscillations. This is caused by a combination of the engine/propeller torque and pilot weight shift and/or brake inputs. To stop oscillations it is best to reduce the power slightly and ensure that you remain static with weight shift and brake inputs. Once settled you can once again apply full power. Under full power the torque effect will attempt to gently turn the wing, using weight shift or adjusting the trims asymmetrically is the best method to correct this.

Normal Flight

Once at a safe height you can release the trimmers for a faster cruise speed. If your motor has enough power, the Spark 2 will achieve very good straight line speeds whilst maintaining level flight with trims fully released and full speed bar applied. Be cautious when releasing the trimmers, only do so in calm conditions.

Flying at trim speed (hands-up, trimmers pulled to the slow position), the Spark 2 will achieve its 'best glide' speed for still air. You should fly at this speed when gliding downwind or when the air is not excessively sinking. For better penetration in headwinds and improved glide performance in sinking air, crosswinds or headwinds, you should fly faster than trim speed by using the accelerator system or trimmers. Using up to half bar does not degrade the glide angle or stability significantly and will improve your flying performance. At full speed the Spark 2 is stable; however we recommend that you do not fly at full speed close to the ground or in turbulent air.

By pulling the trimmers to the slow position and applying a small amount of brake, the Spark 2 will achieve its best minimum-sink rate; this is the speed to use for thermalling and ridge soaring whilst free flying. For maximum efficiency whilst flying downwind, release the speed bar and return the trimmers to the slow position.

IMPORTANT
In turbulent air return the glider to trim speed - release the speed bar and return the trims to the slow position

IMPORTANT
Never apply the brakes whilst flying at full speed - it makes the wing more prone to collapse.

Turning

To familiarize yourself with the Spark 2 your first turns should be gradual and progressive. To make efficient and coordinated turns with the Spark 2 first look in the direction you want to go, then lean into it. Your first input for directional change should be weight-shift, followed by the smooth application of the brake until the desired bank angle is achieved. To regulate the speed and radius of the turn, coordinate your weight shift and use the outer brake.

IMPORTANT
Never initiate a turn at minimum speed (i.e. with full brakes on) as you could risk entering a spin.

Active Flying

To minimize the likelihood of suffering collapses in turbulent conditions, it is essential to use active flying. These are skills that are best learnt by playing with the glider on the ground. Flying with a small amount of brake applied (approx. 20cm) will allow you to feel the feedback from the wing. In turbulent conditions the internal pressure of the wing is constantly changing and only by using a small amount of brake will you feel these changes. The aim of active flying is to maintain a constant pressure through the brakes, If you feel a reduction or loss of pressure apply the brakes until you feel normal pressure again. Once you have normal pressure, raise the hands quickly back to the original position. Avoid flying with continuous amounts of deep brake in rough air as you could inadvertently stall the wing. Always consider your airspeed.

These movements can be symmetric or asymmetric; you may have to apply both brakes or just one. These subtle adjustments will keep the glider flying smoothly and directly above you and dramatically reduce the chances of a collapse. If the glider pitches in front of you, use the brakes to slow it down. Equally, if the glider drops behind you, release the brakes to allow it to speed up. The goal is to always keep the wing directly overhead.

IMPORTANT
Always keep hold of your brakes. Do not fly in turbulent conditions

No pilot and no glider are immune to collapses however active flying will virtually eliminate any tendency to collapse. When the conditions are turbulent, be more active and anticipate the movements of your wing.

Landing

The Spark 2 shows no unusual landing characteristics but as a reminder, here are some tips:

- Always set up for your landing early, give yourself plenty of options and a safe margin for error.
- Once below 30 metres avoid turning tightly as the glider will have to dive to accelerate back to normal flight. If you are at low altitude, or if you hit sink, this could mean you hit the ground harder than necessary.
- Lean forward out of your harness before the actual landing (especially if it's turbulent), with your weight leaning forward against the chest strap, and make sure your legs are ready for the landing and a possible PLF (parachute landing fall).
- Allow the glider to fly at hands up (trim) speed for your final descent until you are around 1 metre above the ground (in windy or turbulent conditions you must fly the glider actively all the way). Apply the brakes slowly and progressively to slow the glider down until groundspeed has been reduced to a minimum and you are able to step onto the ground.
- In light winds/zero wind you need a strong, long and progressive flare to bleed off all your excess ground speed. In strong winds your forward speed is already low so you are flaring only to soften the landing. A strong flare may result in the glider climbing upwards and backwards quickly, leaving you in a vulnerable position.
- If the glider does begin to climb, ease off the brakes (10-20cm) - do not put your hands up all the way - then flare again, but more gently this time. Keep the brakes at mid speed, stand up, be ready to run and make sure you brake fully as you arrive on the ground.
- Choose the appropriate approach style in function of the landing area and the conditions.
- In strong winds you need to turn towards the glider the second your feet touch the ground. Once facing the wing pull smoothly and symmetrically down on the brakes to stall the wing. If the glider pulls you, run toward it.
- If the wind is very strong, and you feel you might be dragged, or lifted again, stall the glider with the C risers. This stalls the wing in a very quick and controllable way and will drag you less than if you use the brakes.
- Always land heading into wind!

RAPID DESCENT TECHNIQUES

Ozone would like to remind you that the following manoeuvres should be learnt under the supervision of a qualified instructor and always used with caution. Never forget that properly analysing the conditions before launch will help avoid the need to use these techniques.

Big Ears

Folding in the wingtips increases the sink rate without radically changing the airspeed. This is useful for staying out of cloud or descending quickly through the lift band of the hill, for example when top landing.

NEVER induce Big Ears in accelerated flight, this can lead to a major deflation. Always pull the Big Ears first and then apply the speed bar.

To pull big ears, keep hold of your brake handles and take the outermost A-line on each side, then pull out and down (preferably one at a time) until the wingtips fold under. The Outer A line is attached to the Baby A riser, making identification and use of the big ear system easier. The size of the big ears can be adjusted by pulling more line, or reaching higher up the line. For directional control while using the Big Ears, you should use weight shift. To reopen the ears, release both A lines at the same time. To help reinflation, brake gently one side at a time until tips regain pressure. Avoid deep symmetric applications of the brake as this could accidently induce parachutal or full stalls.

You may use Big ears for the final landing approach but they should be released before making the final flare. Ozone advise to not use this technique in turbulent or windy conditions due to the reduced ability to fly actively and the risk of an inadvertent stall whilst descending through the wind gradient.

Once the big ears are engaged you can further increase the sink rate by pushing on the accelerator bar, however NEVER try to pull the Big Ears in if the accelerator is already pushed. The lower angle of attack and the act of deflating the tips can lead to a major deflation. Always make the Big Ears first and then apply the speed bar.

DO NOT perform spiral dives with Big Ears engaged.

Whilst it is possible to enter a spiral dive whilst holding in Big Ears, the high forces applied to the lower lines could exceed the breaking strain of the lines leading to equipment failure!

Ozone strongly recommend to NOT perform Spiral Dives with Big Ears engaged.

B-Line Stall

The B-line stall is for fast descents in emergency situations only, it is faster and safer to lose altitude with a spiral dive than a B-stall. To initiate the B-stall, keep the brakes in your hand and take hold of both the B risers, or place your fingers between the lines above the maillons. As you pull the B-lines down the airflow over the wing is broken and the glider loses its forward speed but remains open with a reduced cord. You can descend at around 6 m/s. To exit the B-stall the B-risers should be released symmetrically and in one smooth, progressive motion. The glider will resume normal forward flight without further input. Check you have forward flight again before using the brakes. If you pull too much B-line the glider may horseshoe and move around a lot. If this occurs, slowly release the B lines until the wing stabilises or simply exit the B line stall by immediately release the B risers. Do not attempt to maintain a B line stall that is not stable.

Spiral Dives

If you turn your glider in a series of tightening 360's it will enter a spiral dive. This will result in rapid height loss. To initiate a spiral, look and lean in to the direction you want to go, then smoothly pull down on the inside brake. The Spark 2 will first turn almost 360 degrees before it drops into the spiral. Once in the spiral you should re-centre your weight shift and apply a little outside brake to keep the outer wing tip pressured and inflated.

Safe descent rates of more than 8m/s (1600 ft/min approx.) are possible in a spiral dive, but at these rates the associated high speeds and G-forces can be disorientating. Always pay particular attention to your altitude. To exit the spiral dive, ensure your weight shift is in a centred position and then smoothly release the inside brake. As the Spark 2 decelerates allow it to continue to turn until enough energy is lost for it to return to level flight without an excessive climb and surge.

The Spark 2 shows little tendency to remain neutral in a spiral dive; however some parameters could interfere with its behaviour. These might include: wrong chest strap settings, total weight in flight outside of the certified weight range, or being in a very deep spiral at a very high sink rate >14m/s. You should always be prepared to pilot the wing out of such a spiral dive. To do so, smoothly use opposite weight shift and apply enough outside brake to stop the wing from spiralling, the glider will then start to resume normal flight. Never attempt to recover from a spiral with hard or quick opposite inputs as this will result in an aggressive climb and surge.

IMPORTANT

Always be prepared to pilot the wing out of a spiral dive. Use opposite weight shift and apply enough outside brake to stop the wing from spiralling.

Deflations

Due to the flexible form of a paraglider, turbulence may cause a portion of the wing suddenly to collapse. This can be anything from a small 30% (asymmetric) collapse to a complete (symmetric) collapse.

If you have a collapse, the first thing to do is to control your direction. You should fly away from the ground or obstacles and other pilots. Asymmetric collapses should be controlled by weight shifting away from the collapse and applying enough brake to control your direction. This action alone will be enough for a full recovery of the wing most of the time.

Once a glider is deflated it is effectively a smaller wing, so the wing loading and stall speed are higher. This means the glider will spin or stall with less brake input than normal. In your efforts to stop the glider turning towards the collapsed side of the wing you must be very careful not to stall the side of the wing that is still flying. If you are unable to stop the glider turning without exceeding the stall point then allow the glider to turn whilst you reinflate the collapse.

If you have a deflation which does not spontaneously reinflate, make a long smooth progressive pump on the deflated side. This pumping action should take about 1-2 seconds per pump. Pumping too short and fast will not reinflate the wing and pumping too slow might take the glider close to, or beyond, the stall point.

Symmetrical collapses reinflate without pilot input, however 15 to 20cm of brake applied symmetrically will speed the process. After a symmetric collapse always consider your airspeed. Make sure the glider is not in parachutal stall before making any further inputs.

If your Spark 2 collapses in accelerated flight, immediately release the accelerator and manage the collapse using the same methods described above.

WARNING

Uncoordinated wingovers can lead to large asymmetric collapses and cravats, therefore they should never be executed near the ground.

Cravats

If the tip of your wing gets stuck in the lines, this is called a ‘cravat’. This can make your glider go into a spiral, which is difficult to control. The first solution to get out of this situation is to stabilise the glider into normal flight, i.e get control of your direction and then pull down the stabilo line (BR4 - outside line on the B riser) until the wing tip clears. You must be careful with any brake inputs or you may stall the opposite wing. You can also use strong deep pumps of the brake on the cravated side, when doing so it is important to lean away from the cravat otherwise you risk spinning or deepening the spiral. The aim is to empty the air out of the wing tip, but without spinning. Correctly done, this action will clear the cravat.

If it is a very large cravat and the above options have not worked then a full stall is another option. This should not be attempted unless you have been taught how to do it and can only be done with a large amount of altitude. Remember if the rotation is accelerating and you are unable to control it, you should throw your reserve parachute whilst you still have enough altitude.

IMPORTANT

A bad preparation on launch, aerobatic flying, flying a wing of too high a level or in conditions too strong for your ability, are the main causes of cravats.

Deep Stall / Parachutal Stall

It is possible for gliders to enter a state of parachutal stall. This can be caused by several situations including; a very slow release from a B-line stall; flying the glider when wet; or after a front/symmetric deflation. The glider often looks as though it has recovered properly but carries on descending vertically without full forward motion. This situation is called ‘deep stall’ or ‘parachutal stall’.

It is unlikely to happen on any Ozone glider, but should it do so your first reaction should be to fully raise both hands. This normally allows the glider to return to normal flight but If nothing happens after a few seconds, reach up and push the A-risers forwards or apply the speed bar to encourage the wing to regain normal flight. Ensure the glider has returned to normal flight (check your airspeed) before you use the brakes again.

IMPORTANT

Only a few cms of input from your brakes can maintain your wing in the stall. Always release your wraps if you have taken them!

Do not fly in rain, doing so significantly increases the likelihood of parachutal stalls occurring. To reduce the chance of stalling in rain avoid using deep brake movements or Big Ears. Find a safe area to land and using the speed bar, maintain a good airspeed at all times.

IMPORTANT

Never fly in the rain or with a wet glider

CARE AND MAINTENANCE

Packing

To prolong the life of your wing and to keep the plastic reinforcements in the best possible condition it is very important to pack the wing carefully.

Ozone recommends to use the concertina packing method exactly as shown so that all of the cells rest alongside each other and the plastic reinforcements are not unnecessarily bent. You can however use the traditional half and half method. Using an Ozone Saucisse or Saucisse light pack will help preserve the life of the wing and aid with the speed and ease of packing.

Step 1. Lay mushroomed wing on the ground. It is best to start from the mushroomed position as this reduces the dragging of the leading edge across the ground.

Step 2. Group LE reinforcements with the A tabs aligned, make sure the plastic reinforcements lay side by side.

Step 3. Lay wing on its side and Strap LE...Note the glider is NOT folded in half; it is folded with a complete concertina from tip to tip. It is really important to not stress the middle cell or bend the plastic too tightly.

Step 4. Group together the middle/trailing edge of the wing by sorting the folds near the B, C and D tabs.

If using a Saucisse pack go to Step 8.

Step 5. Once the LE and rear of the wing have been sorted, turn the whole wing on its side.

Step 6. Fold the wing with 3 or 4 folds whilst being careful to not crush the LE.

Step 7. Now place the folded wing into the stuff sack.

Step 8. If using the Saucisse Pack, carefully zip it up without trapping any material.

Step 9. Turn the Saucisse on its side and make the first fold just after the LE reinforcements. Do not fold the plastic reinforcements, use 3 or 4 folds around the LE.

IMPORTANT: Do NOT lay the wing flat on the ground before packing the glider, this will cause abrasion damage to the top surface as you pull the glider towards the middle. ALWAYS pack from a mushroom or lift the wing off the ground when gathering the wing and grouping the leading edge.

IMPORTANT: Do not fold the glider in the centre, you will bend the plastics, instead pack the wing with a full concertina method from tip to tip before packing into the stuff sac.

Caring Tips

Careless ground handling damages many paragliders. Here are some things to avoid in order to prolong the life of your aircraft:

- DO NOT drag your wing along the ground to another take-off position - this damages the sailcloth. Lift it up and carry it.
- DO NOT try to open your wing in strong winds without untangling the lines first - this puts unnecessary strain on the lines.
- DO NOT walk on the wing or lines.
- DO NOT repeatedly inflate the glider and then allow it to crash back down. Try to keep this movement as smooth as possible by moving towards the glider as it comes down.
- DO NOT slam your glider down on the ground leading edge first! This impact puts great strain on the wing and stitching and can even explode cells.
- FLYING in salty air, in areas with abrasive surfaces (sand, rocks etc.) and ground handling in strong winds will accelerate the aging process.
- DO NOT fly in the rain or expose the wing to moisture.
- DO NOT expose the wing to unnecessary UV. Pack away once you have finished flying. Do not leave it sitting in the sun.
- DO NOT expose the wing to excessive heat. Allow the wing to cool before storage.
- If you fly with a wrap, you should regularly undo the twisting that appears on the main brake lines. By twisting the line become shorter and you can end up with a constant tension on the trailing edge (which can lead to problem on launch, stalling, glider not flying symmetrically, ...)
- Change your main brake lines if they are damaged.
- Be Careful when groundhandling to not saw the brake lines against the risers or main lines. The abrasion caused by a sawing motion can damage the main lines and lead to premature ageing of the risers. If you notice any signs of abrasion, especially to the lines, make sure you get the wing professionally serviced and importantly modify your groundhandling technique to stop any further damage.
- Your Ozone wing has an opening closed using Velcro on the trailing edge of the tip called the ‘Butt hole’. This has been designed to easily empty all the things which have been accumulating in your wing (sand, leaves, rocks, mobile phones etc).

Storage and Transport

Always store all your flying equipment in a dry, cool room protected from any source of excessive heat. Your wing should be dry and cool before being packed away. Moisture, heat and humidity are the worst elements for damaging the fibres and coating of the cloth. Storing a damp glider in your car under the sun would be terrible for example.

IMPORTANT
Never pack away or store your glider wet.

If you land in salt water, you must first rinse it thoroughly with clean fresh water. Dry the wing completely, preferably out of the sun, in the wind. Never use a hair dryer, etc.

Take care that no insects get packed away with the wing. They may eat the cloth and make holes in a bid to escape. They can also leave acidic deposits if they die and decompose.

Transport the wing in the supplied bags and keep away from oils, paints, chemicals, detergents etc.

Cleaning

Any kind of wiping/scratching can damage the coating of the cloth. We recommend to not clean the wing, but if you do have to, use a soft cloth dampened with a small amount of water and use gentle movements little by little across the surface. Remember moisture and abrasion damages the coating of the cloth.

IMPORTANT
Never use detergent or chemical cleaners.

Repairs

Always let a registered dealer, professional repair centre or the manufacturer carry out any major or complex repairs, especially those near seam margins.

If you damage the sail:
If the rip is small and in the middle of a panel you can fix it yourself. You'll find all the materials in the repair kit you need. The fabric can be simply mended with the sticky rip stop/spinnaker tape. When cutting out the patches allow ample overlap of the tear and make sure both sides are different sizes. Make sure to round off each corner of the patches.

You can find more information about repairing your wing on the Ozone website, including step by step instructions with pictures.

If you damage a line:
Any line that is visually damaged MUST be replaced. Use a reputable paragliding service centre to make the replacement lines. Alternatively you can order them from your local Ozone dealer or directly from our website http://www.flyozone.com/paragliders/en/shop/lines.php

It is important that replacement lines are made from the correct materials and diameters. You should check lengths against their counterpart on the other side of the wing to make ensure symmetry. Once the line has been replaced, inflate and check the glider before flying.

Maintenance Checks

In addition to the normal daily and pre flight checks, it is recommended to service the wing regularly, especially after a heavy period of use, after an incident or after a long period of storage. You alone are responsible for your flying kit and your safety depends on it. Changes in inflation/groundhandling/flying behaviour indicates the gliders aging, if you notice any changes you should have the wing checked before flying again.

To ensure proper airworthiness your wing needs to be technically serviced by an experienced professional for the first time after 24 months, or after 100 hours. However, if the wing is used frequently then we recommend an annual service. The service centre should perform a thorough inspection of your wing and inform you of the condition of the sail, risers and lines and whether any parts need to be checked or changed before the next normal service period.

The sail and the lines do not age in the same way or at the same rate; it is possible that you may have to change part or all of the lines during the wing's life. For this reason it is important to do regular inspections so that you know the exact condition of all of the components of your glider.

We recommend these inspections to be carried out by a qualified professional and to include the following:

Porosity is measured with a porosity meter, the time taken by a certain volume of air to go through a certain surface of the cloth. The time in seconds is the result. A measurement is done in a several places on the top surface along the span of the glider behind the leading edge.

Tearing resistance of the cloth - A non-destructive test following the TS-108 standard which specifies minimum tear strength for sky diving canopies should be made using a Bettsometer. (B.M.A.A. Approved Patent No. GB 2270768 Clive Betts Sails)

Line strength - An upper, middle and lower A line, along with a lower B and a lower C (and lower D if applicable) line should be tested for strength. Each line is tested to breaking point and the value recorded. The minimum value is 14 G for all lines, calculated from the maximum certified flying weight of the glider. The added minimum strength for the middle lines and for the top lines should be the same. If the breaking strength is too close to the minimum value calculated, the professional should give a period after which you will have to test the strength of the lines again.

Compliance of the test sample's suspension lines, brake lines and risers were checked by the testing laboratory after the test flights were completed.

Line strength - The overall length (riser lines + mid lines + upper lines) has to be checked under 5Kgs of tension. The difference between the measured length and the original length should not exceed +/- 10mm. The changes that could appear are a slight shrink on the C or Ds and/or a slight stretch on the A, B. The consequences of these changes can include a slower trim speed, difficult inflation etc.

Risers - Visual inspection for signs of wear or abrasion. Differences to manual lengths should not exceed +/-5mm.

Canopy check - A full visual check should be carried out: All the components of the wing (stitching, ribs, diagonals, lines, tabs, ...) should be checked for signs of deterioration.

Flight test - A flight test to confirm that the wing behaves normally should be carried out by a professional.

IMPORTANT

Take care of your glider and make sure you have it checked and serviced according to the schedule.

OZONE QUALITY GUARANTEE

At Ozone we take the quality of our products very seriously, all our gliders are made to the highest standards in our own manufacturing facility. Every glider manufactured goes through a stringent series of quality control procedures and all the components used to build your glider are traceable. We always welcome customer feedback and are committed to customer service. Ozone guarantees all of its products against manufacturer's defects or faults. Ozone will repair or replace any defective product free of charge. Ozone and its distributors provide the highest quality service and repair, any damage to products due to wear and tear will be repaired at a reasonable charge.

If you are unable to contact your dealer then you can contact us directly at info@flyozone.com.

Summary

Safety is paramount in our sport. To be safe, we must be trained, practised and alert to the dangers around us. To achieve this we must fly as regularly as we can, ground handle as much as possible and take a continuous interest in the weather. If you are lacking in any of these areas you will be exposing yourself to more danger than is necessary.

Every year many pilots get hurt launching; don't be one of them. Launching is the time that you are most exposed to danger so practice it lots. Some launch sites are small and difficult and conditions aren't always perfect. If you're good at ground handling you'll be able to confidently and safely launch whilst others struggle...practice as much as you can. You'll be less likely to get hurt and more likely to have a great day's flying.

Respect the environment and look after your flying sites.

If you need to dispose the wing, do so in an environmentally responsible manner. Do not dispose of it with the normal household waste.

Finally, RESPECT the weather, it has more power than you can ever imagine. Understand what conditions are right for your level of flying and stay within that window.

Happy flying & enjoy your Spark 2.
Team Ozone

TECHNICAL SPECIFICATIONS

	25	27	30
No. of Cells	34	34	34
Projected Area (m^2)	20.4	22.1	25.1
Flat Area (m^2)	24.3	26.3	29.9
Projected Span (m)	8.12	8.46	9
Flat Span (m)	10.5	10.93	11.64
Projected Aspect Ratio	3.24	3.24	3.24
Flat Aspect Ratio	4.54	4.54	4.54
Root Chord (m)	2.87	2.99	3.18
Glider Weight (Kg)	4.55	4.75	5.2
Max Control Travel (cm)	65	75	75
EN Weight Range (Kg)	65-90	75-105	95 - 125
DGAC PPG range (kg)	65-110	75-125	95-140
Maximum Load 8G (kg)	148	148	148
Maximum Load 5.25G (kg)	226	226	226
Certification EN/LTF*	A	A	A
DGAC Approved	Yes	Yes	Yes

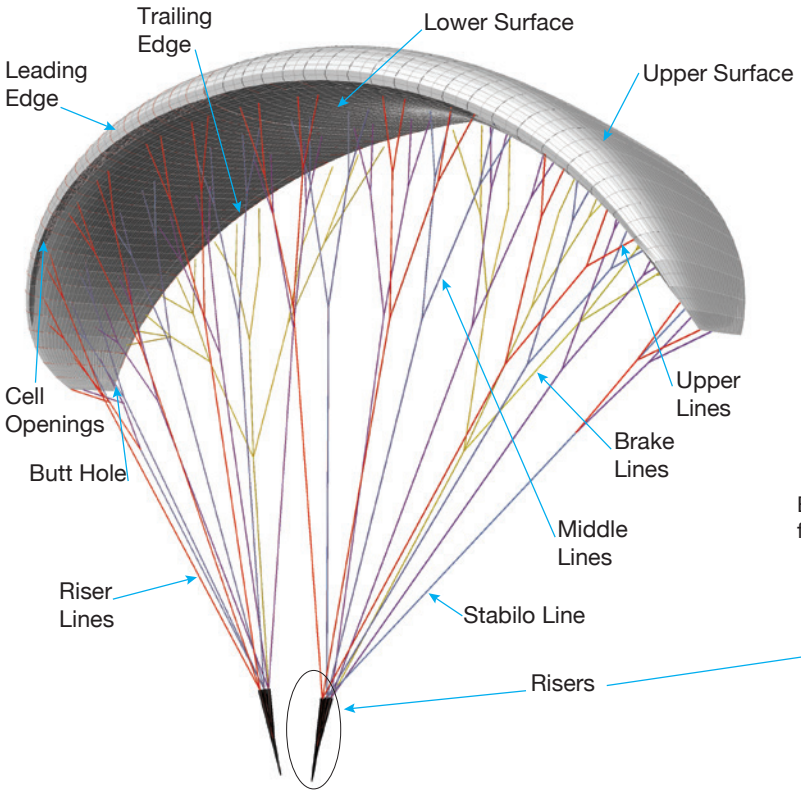
* As delivered, the wing does not conform to the EN 926.2 standard due to the inclusion of the trimmer risers. Please refer to pages 05/07

Riser Lengths

Non Accelerated	
A	500
a	500
B	500
C	500
Accelerated Speed bar	
A	410
a	410
B	430
C	500
Fully Untrimmed	
A	500
a	500
B	520
C	560
Fully Accelerated	
A	410
a	410
B	430
C	560

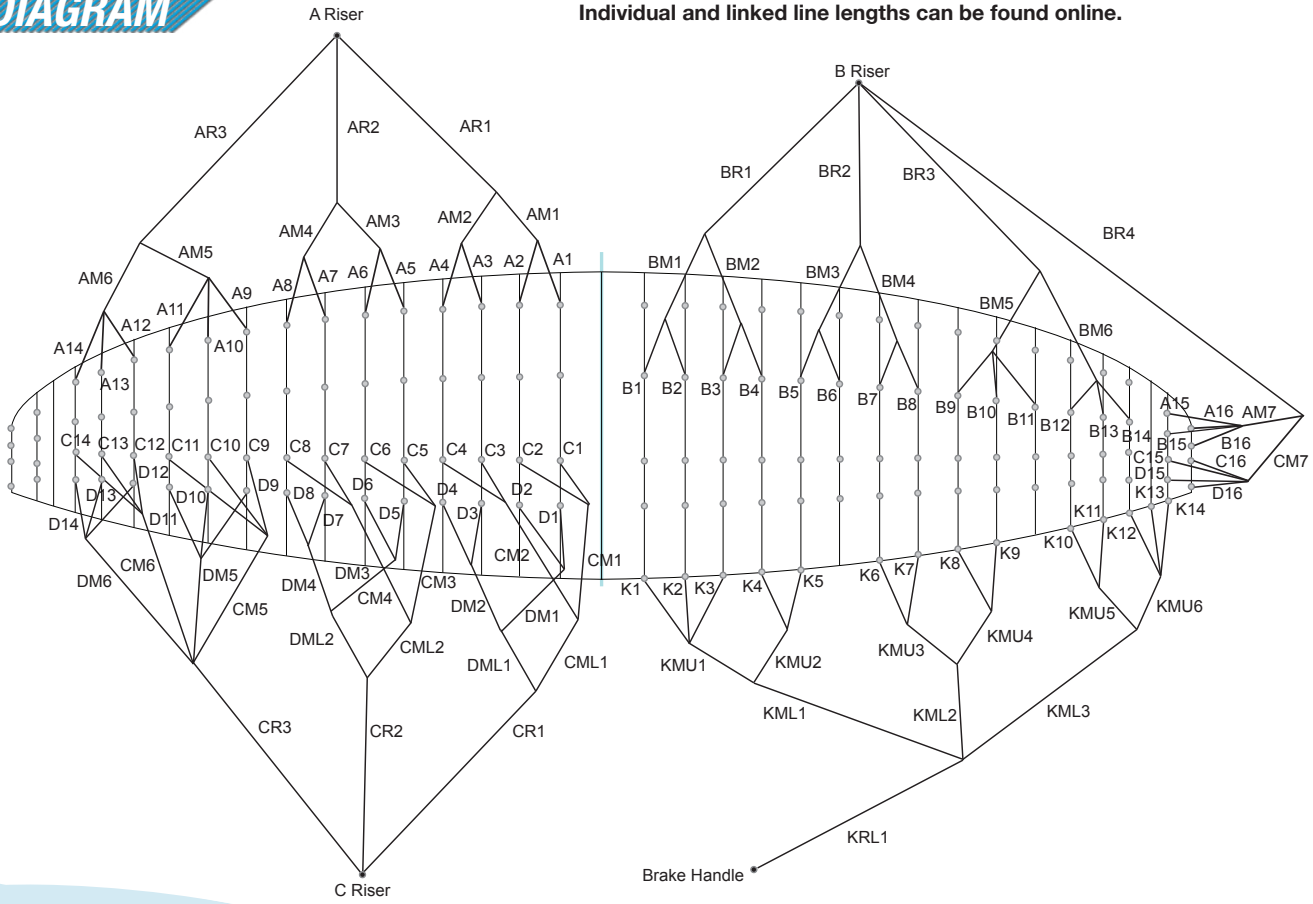
TECHNICAL DRAWINGS

EN



LINE DIAGRAM

Individual and linked line lengths can be found online.



MATERIALS

All Ozone gliders are made from the highest quality materials available.

Cloth

Upper Surface
Dominico DOKDO 30D
Lower Surface
Dominico DOKDO 30D
Internal Ribs
Dominico DOKDO 30D FM
Leading Edge Reinforcement
1.8mm / 1.4mm Plastic pipe

MainLine Set

Riser Lines
Edelrid 6843 - 200/160
Middle Lines
Liros DSL - 140/70
Upper Lines
Liros DSL - 70

Brake Lines

Main brake Lines
Liros - 10-200-040
Middle brake lines
Liros DSL - 70
Upper brake lines
Liros DSL - 70

Risers and hardware

Maillons
Maillon Rapide - Pegeut
Riser webbing
20mm zero stretch polyester webbing
Pulleys
Austri Alpin

1258 Route de Grasse
Le Bar sur Loup
06620
France

Inspired by Nature, Driven by the Elements

www.flyozone.com