

# Kangaroo<sup>FOUR</sup>

TANDEM LTF/EN C

You can fly

TO LIVE UP



PARAGLIDERS  
[www.solparagliders.com.br](http://www.solparagliders.com.br)



Manual do piloto  
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## WELCOME TO THE **SOL** TEAM!

Thank you for selecting a **SOL** paraglider. You have just acquired a high quality product, manufactured under one of the most demanding industry standards worldwide.

We trust your **KANGAROO 4** will bring you many great life memories you will cherish forever.

We would like you to read this manual carefully and thoroughly. In it, you will find important information about using your new equipment.

In the event you should have any questions about its usage or should you wish to be updated on the latest news at **SOL**, we remain at your disposal:

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**Don't forget to access our website often at**

<http://www.solspargliders.com.br>.

to keep current on the latest models' launchings, results and news from the world of paragliding.

*Welcome to the SOL Team!*



## Attention

Please read this manual carefully and note the following details:

- This paraglider meets at the time of delivery the requirements of the LTF / EN certification or of the EN!
- Any equipment alteration will result in the cancellation of this respective certification.
- Flying with this equipment shall be performed at the individual's own risk.
- The manufacturer and its representatives are not liable and therefore not responsible for any misuse nor mishandling of this equipment.
- It is a basic assumption that the pilot is certified to fly this paraglider.
- Every pilot is responsible for the maintenance and assessment of equipment usability.



## About **SOL**

Founded in **1991**, after six months of research and many visits to several manufacturing facilities and suppliers, **SOL** began its production in partnership with the European brands Condor, Comet and Nova.

**SOL** became autonomous in **1999** with its own testing and development centers. From the beginning **SOL** has adopted the philosophy of utilizing certified designs, manufactured with imported materials of the highest quality by specialized and skilled-trained staff.

In early **2004** **SOL** became certified by DHV, which is the most respected regulating body of free-flying worldwide. Its mandate is to make sure its members have the capacity to reproduce faithfully the certified equipment on an industrial scale. Few facilities in the world possess this certification in their manufacturing process. **SOL** was one of the firsts to obtain it!

In **1995**, the company moved to its current facility, occupying an area of 4.000 m<sup>2</sup> and has at its disposal a team of about 140 employees, of which are about 20% pilots. **SOL** provides a comprehensive benefits package such as Health Plan, Life Insurance, partnerships with pharmacies, transportation vouchers, incentive getaways to employees who outperform each month, and education grants. At **SOL**, we take extreme measures to maintain our machinery and manufacturing equipment current with the world market. This way, we safeguard our accuracy everyday in the production process, control and assuring the high quality of **SOL** brand and products throughout more than 70 countries around the world.the world!

## Philosophy

**SOL**'s philosophy is to introduce products that are considerably better than current ones, in order to guarantee significant advancements in four aspects: Safety, Performance, Ease of Operation and Innovation.

**Safety:** The new product has to offer a level of safety that is at par or better than the one it is replacing.

**Performance:** The new product must perform better than the one it is replacing.

**Ease of Operation:** The new product must display higher levels and better operational ease than the one it is replacing.

**Innovation:** New products must display real benefits to the user, facilitating free-flying, increased safety, or both.

The development process and design of every new product begins at the computer. Drawing Software, 2D, 3D modeling and simulation are utilized before the actual manufacturing of prototypes, in order to ensure greater accuracy in each new design.



## **KANGAROO 4 - To live up**

The **KANGAROO 4** is a tandem glider. That means he is built for pilots who want to take others up into the sky and who are qualified for this adventure **KANGAROO 4**, is a light air sport equipment with less than 120 kg of weight. The **KANGAROO 4** has excellent performance and aerodynamics. The **KANGAROO 4** is a glider who inspires you to reach out for new experience, performance and long distant flights. His security and stability will please you and your passenger on your way up to the clouds. Enjoy your flights. This manual contents all the information you need.

## **KANGAROO 4 - The Project**

The **KANGAROO 4** consists of 65 cells and has internal crossed diagonals applied at the profiles to distribute the weight uniformly. This maintains the canopy very shapely and cleans and reduces the induced drag.

The **KANGAROO 4** was designed at the new software. Its enhanced design and profile are the result of our continuous development and refinement process in terms of performance paired with stability. The improved features of this project permit a large speed range and excellent stability.



## Kangaroo 4 - Technology

The **Kangaroo 4** combines our technology of performance, safety and long life:



- **PBP** - Pressure Booster Profile: New profile design who maintains form and pressure. This increases the performance in all velocities.



- **HPAR** - High Project Aspect Ratio: higher A/R in each class.



- **LCT** - Laser Cut Technology: Panels, profiles and parts cutting with Laser equipment.



- **HTM** - High Tech Materials – highest technology materials guarantee durability - Technora Lines, Diax Laminates, Inox Hardware, Polyester of High Tenacity.



- **3 Risers System** - Three Risers row in all levels - less 25% line consumption.



- **BT** - Battens Technology: Flexible battens applied in order to maintain the profile characteristics in every moment of the flight.



- **SLS - Seamless Stabilo** - The Stabilizers leading edge has no junctures and is seamless.



- **DVT** - Double V-Tabs: System of double crossed diagonals which create a solid centre of the canopy.



- **FHT** - Full Hybrid Technology is the hybrid utilization of 2 types of fabrics and lines. An optimised combination of durability and resistance with low deformation and less weight..



- **MR** - Profiles between the cells of the trailing edge, which improve performance and handling.



- **BOW** - Greater lift in the same sail area and better pressure distribution across wingspan glider.



## Kangaroo 4 - Technical Data

### Kangaroo 4 - Data

Modelo/Model Modell/Modèle	Kangaroo 4	
Zoom/Zoom Zoom/Zoom	1	
Células/Cells Zellen/Cellules	65	
Envergadura porj./Projected span Projizierte Spannweite/Envergure projetée	12,1	m
Área projetada/Projected surface Projizierte Fläche/Surface projetée	31,77	m <sup>2</sup>
Alongamento projetada/Projected A/R Projizierte Streckung/Allongement projetée	4,61	
Envergadura real/Real span Reale Spannweite/Envergure réelle	15,2	m
Área real/Real surface/ Reale Fläche/Surface réelle	36,99	m <sup>2</sup>
Alongamento real/Real A/R Reale Streckung/Allongement réelle	6,25	
Diâmetro das linhas/Line Diameter Leinendurchmesser/Diamètre suspente	0,6 - 1,0 - 1,2 - 1,5 - 2,1 - 2,5	mm
Altura/Height Leinenlänge/Suspentage	944	cm
Perfil max./Max. profile Max. Profiltiefe/Profil max.	304	m
Perfil min./Min. profile Min. Profiltiefe/Profil min.	48	m
Peso da vela/Weight Gewicht/Poids	8,9	kg
Peso de decolagem/Take off weight Startgewicht/Poids total Volant	140-204 308-449	kg lbl
Afundamento min./Min. sinkrate Min. Sinkrate/Taux de chute min.	1	m/s
Velocidade min.* / Min. Speed* Min. Geschwindigkeit* / Vitesse min.*	24 +/-2	km/h
Vel.max. trimmers fechado* Max. speed trimmers closed* Max. Geschwindigkeit trimmer geschlossen* Vitesse max trim fermé*	42 +/-2	km/h
Vel. max. trimmers aberto* Max. speed trimmers open* Max. Geschwindigkeit Trimmer offen* Vitesse max trim ouvert*	52 +/-2	km/h
Planeio/Glide Gleitzahl/Finesse	10,6	
Assentos/Seat Sitzplätze/	2	
Certificação/Certification Certification/Certification	C	EN/LTF

\* The performance depends on the total weight, the position of the pilot and the aerodynamics of the harness.

The identification and information etiquette is located in the center profile of the leading edge.



## **KANGAROO 4 - Materials**

### **Top / Bottom**

Wtx40 PU+Silicon Coating 40 gr/m<sup>2</sup>

### **Profiles and Internal Diagonal Reinforcements**

Pro-Nyl High Tenacity

Nylon Rip-Stop Hard finish 42gr/m<sup>2</sup>

### **Reinforcements**

Nylontabs

### **Lines**

The lines are made of Technora and Vectran they are known for its high grade of resistance and low stretching overtime. The main lines have a diameter of: 2.5 / 2.1 / 1.5 / 1.0 / 0.6 mm. The upper and middle lines have a diameter of: 2.1 / 1.0 / 0.6 mm.

### **Risers**

Fitanew 19 x 2,0 mm Flat Multi 1600 kg

### **Quick Links**

Ansung Precision 22 mm BI 800 kg

### **Pulleys**

So **SOL** | PL14

All components are made of high quality materials and were selected for a long life purpose.

Type of line	12100 Vectran	16330 Vectran	12470 Vectran	988-2,1	988-2,5
Line manufacturer	Cousin FR	Cousin FR	Cousin FR	Cousin FR	Cousin FR
Test number of line bending test	LKT-0561	LKT-0559	LKT-0558	236,8 daN	382,0 daN
Diameter	0,6 mm	1,0 mm	1,2 mm	2,1 mm	2,5 mm
Material core	Vectran	Vectran	Vectran	Technora	Technora
Material cladding	none	none	none	Polyester	Polyester
Line strength bended	27,9 daN	85,7 daN	128,9 daN	151,1 daN	196,8 daN



### **Materials and limits of use**

Avoid storing the glider for long periods in areas with high humidity, heat or extreme cold, this causes premature aging of the materials and could influence the flight characteristics of your glider.

The LTF Norm quotes:

\* Temperatures from  $-30^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  during the storage should not interfere with the security during the use of the equipment.

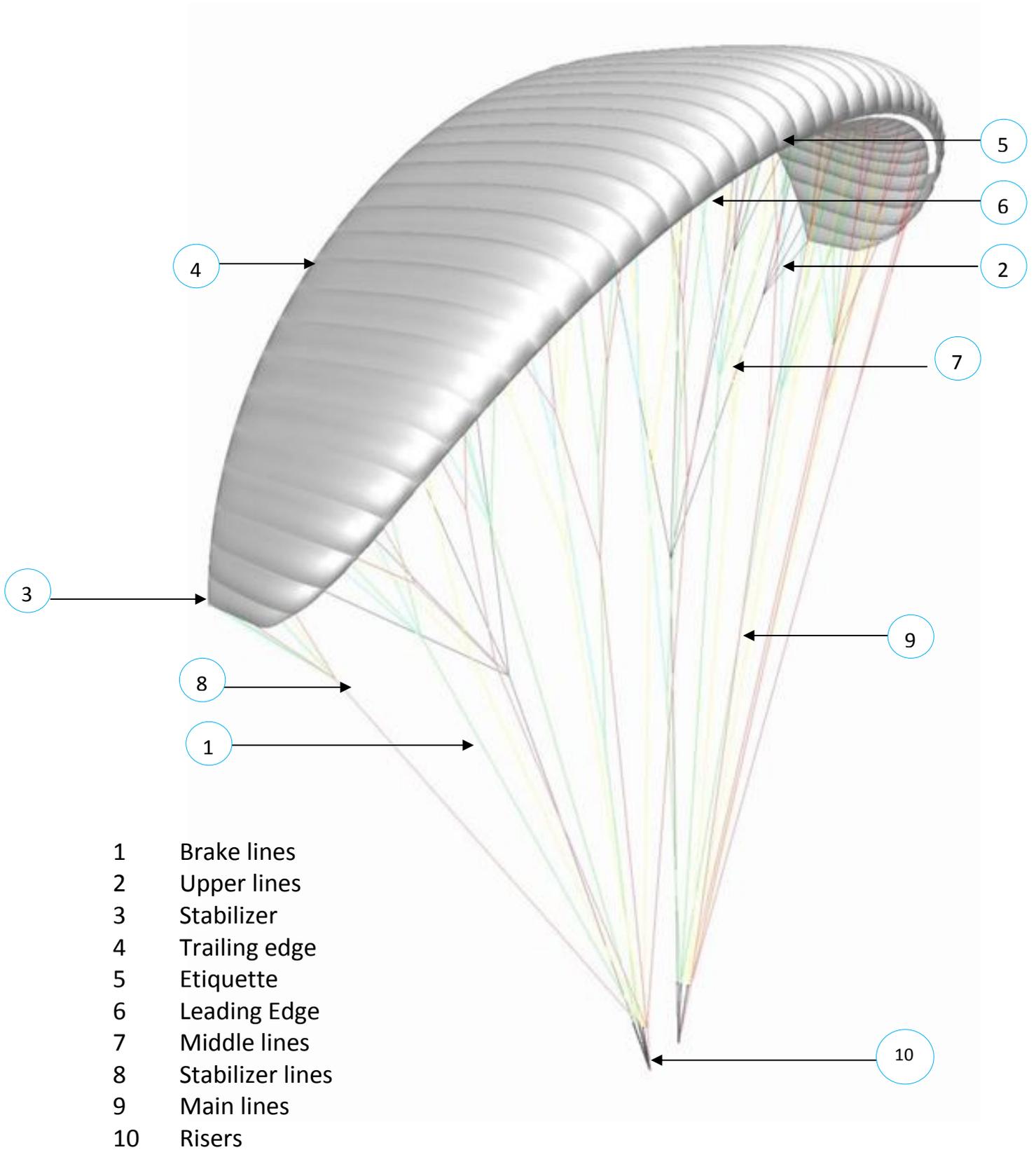
\* Temperatures from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  and oscillation of the relative air humidity between 25% and 100% during use should not interfere with the security.

Remember, you have acquired a high quality product which has been produced with carefully chosen materials. Think carefully about the storage and handling of your glider.

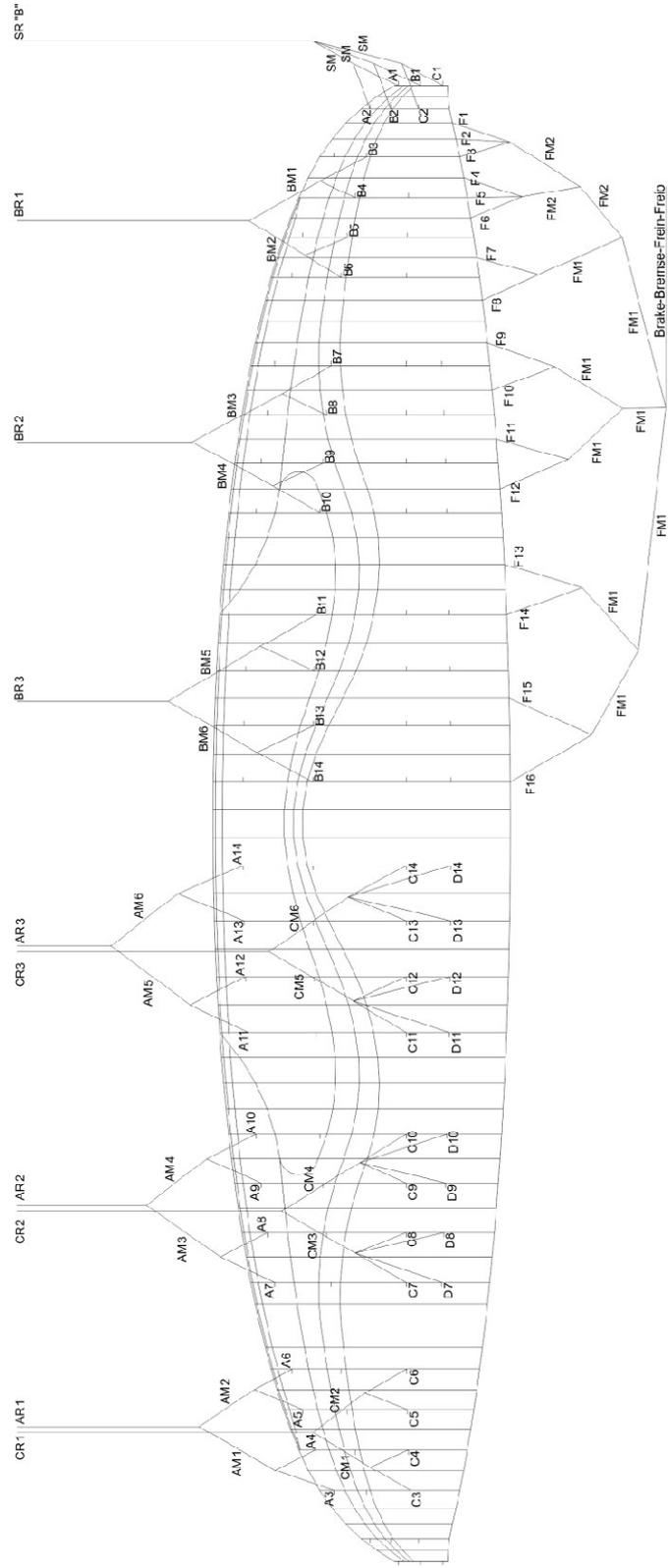
**The permission of use expires with  $-30^{\circ}\text{C}$ .**



### Kangaroo 4 - Over all vision



# KANGAROO 4



### Kangaroo 4 - Suspension system

The **KANGAROO 4** lines consist of a beige technora core of high resistance to tension and has low distortion rate, covered by a layer of colored polyester. The set is made of individual lines, with sewn ties on both extremities.

The upper lines distinguish themselves (next to the inside layer) and the main lines, which are connected to the Quick Links. These, in turn connect to the main lines on the risers. The stabilizers' lines are connected to the same Quick Links.

The brake lines come out of the trailing edge, through the master line and are linked to the toggles, passing through a pulley attached to the 'C' riser.

Lines 'A' and the brake lines are of different color in order to facilitate takeoff preparation.

On the brakes' master lines, there is a mark at the ideal setting point, at which height the toggles are affixed. This setting should not be altered as it ensures adequate and sufficient path and room for the toggles in case of emergency situations during flight and landing.

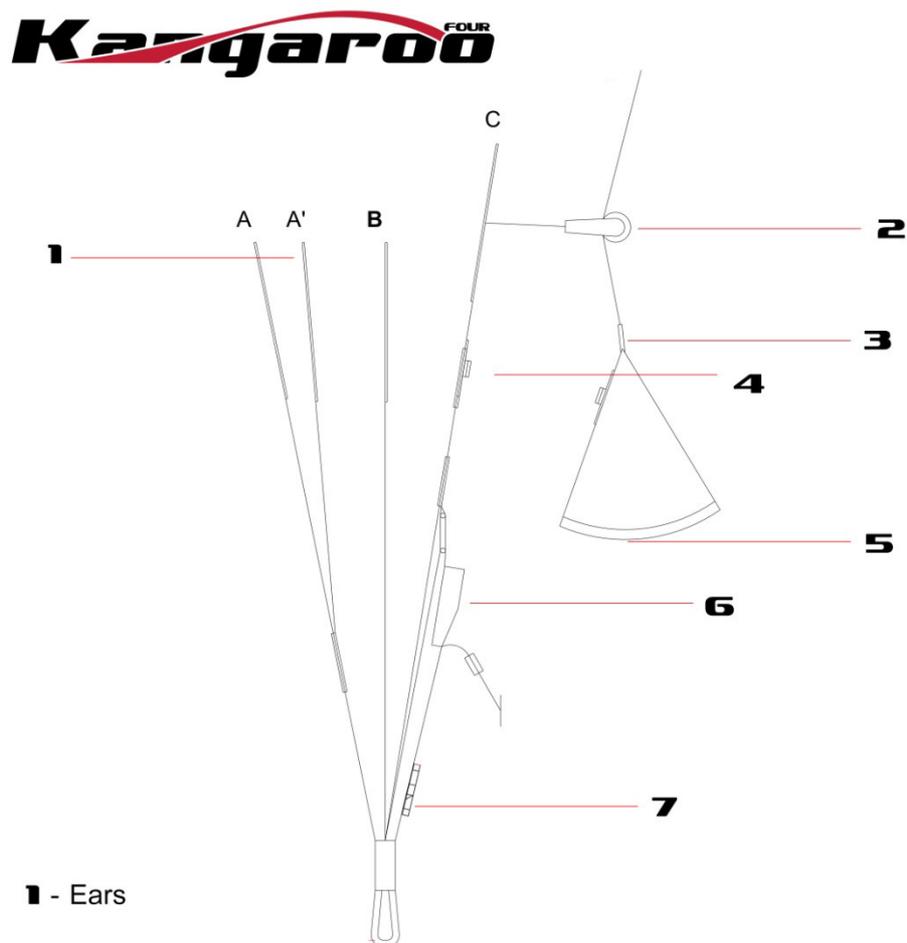
### Kangaroo 4 - Line lengths

<b>KANGAROO 4</b>							
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>			<b>F</b>
<b>1</b>	8315	8336	8391			<b>1</b>	8777
<b>2</b>	8423	8392	8425			<b>2</b>	8774
<b>3</b>	8674	8653	8646			<b>3</b>	8795
<b>4</b>	8762	8740	8742			<b>4</b>	8818
<b>5</b>	8877	8847	8854			<b>5</b>	8832
<b>6</b>	9002	8964	8976			<b>6</b>	8886
<b>7</b>	9160	9110	9127	9216		<b>7</b>	8941
<b>8</b>	9151	9094	9118	9218		<b>8</b>	9012
<b>9</b>	9184	9120	9152	9260		<b>9</b>	9044
<b>10</b>	9266	9199	9234	9344		<b>10</b>	9056
<b>11</b>	9337	9262	9306	9426		<b>11</b>	9105
<b>12</b>	9293	9219	9266	9394		<b>12</b>	9193
<b>13</b>	9323	9244	9294	9424		<b>13</b>	9348
<b>14</b>	9410	9333	9382	9508		<b>14</b>	9411
						<b>15</b>	9633
* With Risers closed trimmer						<b>16</b>	9923



### KANGAROO 4 - Risers

The **KANGAROO 4** has 3 riser's on each site. All A lines are attached to the A riser. The A1 riser is for the ears. The B lines and stabilo lines are attached to the B riser. The C riser leads to all the C lines. The brake lines are going to the pulley which is attached to the C riser. The Glider has a trimmer but no accelerator.

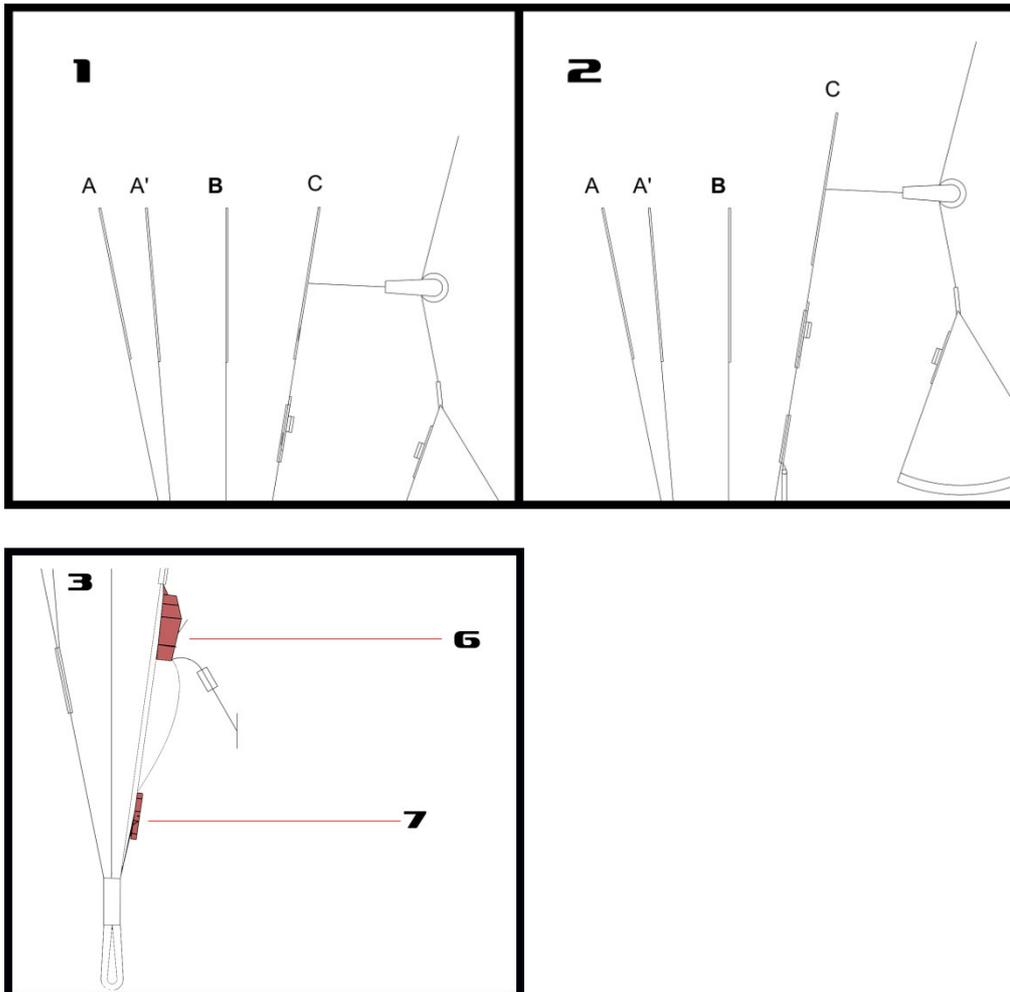


- 1** - Ears
- 2** - Brake pulley
- 3** - Swivel
- 4** - Magnetic clip
- 5** - Toggle
- 6** - Trimmer
- 7** - System to change trimmer webbing



### Kangaroo 4 - Trimmer

The risers of the **Kangaroo 4** have a system of a trimmer (figure 3: 6), on neutral point all risers A, A', B, C are in the same line (figure 1). If the trimmer is used the risers are not aligned. This results in speed increase. (figure 2)



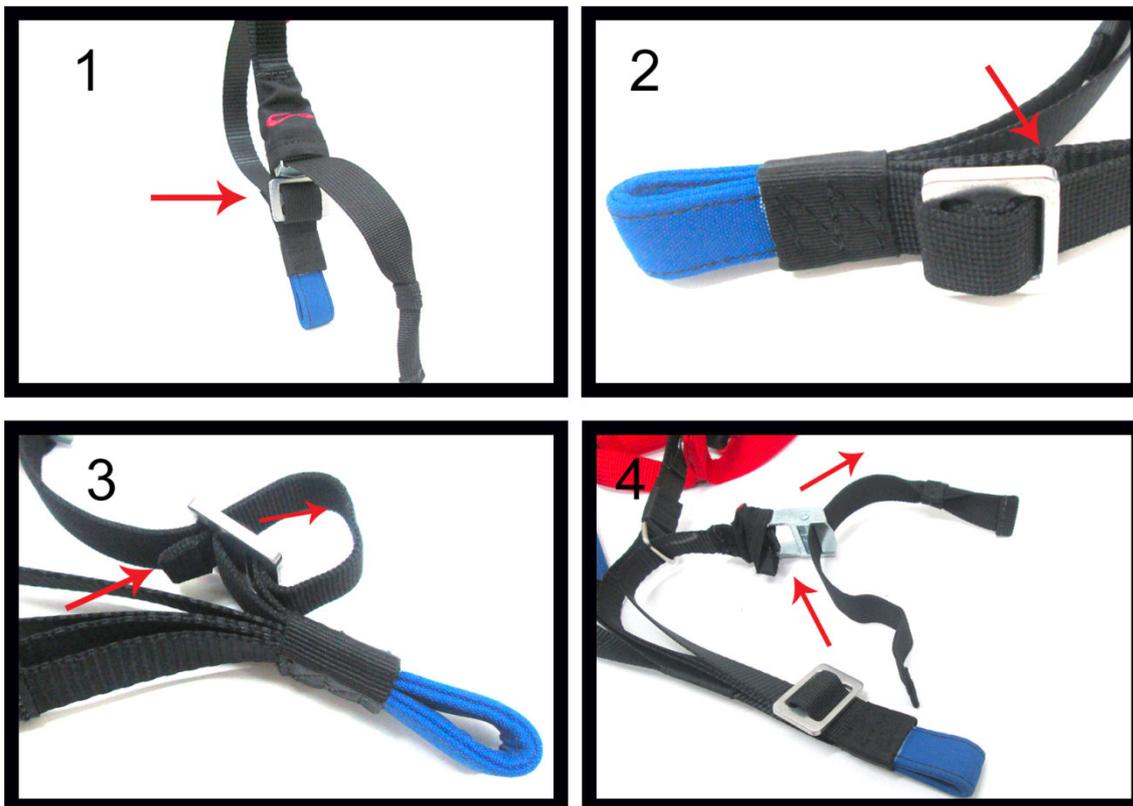
#### Attention

- The use of the trimmer enables more speed.
- The use of the trimmer makes your glider more vulnerable for closings.
- Never let go of the toggles.



### **Kangaroo 4 - Changing the trimmer tab**

The trimmer tab may be damaged after hours and hours of use. The riser of the **Kangaroo 4** permits an easy change of the tab.



### **Kangaroo 4 - Trimmer at action**

	'A'	'A1'	'B'	'C'
<b>Trimmer closed</b>	390mm	390mm	390mm	390mm
<b>Trimmer open</b>	390mm	390mm	390mm	430mm

The Glider has no further parts that could be adjusted.



### **KANGAROO 4 - Tandem spreads**

The pilot is connected behind the passenger on the shorter end of the tandem connection thus reaching easier the control handles and risers. In case of a big weight difference between pilot and passenger, the tandem connection offers various points to fix the passenger always maintaining the ideal position of balance.

Comparing with a mono glider, the risers of the KOALA are shorter in order to compensate the height of the tandem connection that connects the passenger with the pilot.



#### **Risers**

A1 - Ears

D - Toggle

E - Trimmer

#### **Tandem spreads**

1. Main carbine

2. Rescue system connection

3. Pilot

4. Passenger heavier than pilot: position 4

5. Passenger with similar weight: position 5

6. Passenger lighter than pilot: position 6

The Glider was presented by:

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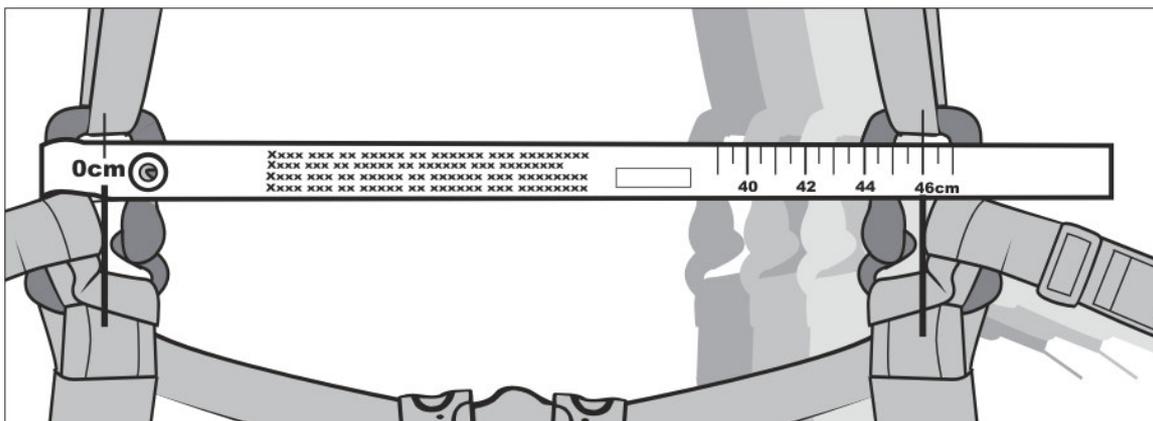


### Kangaroo 4 - Harness

Any harness of type ABS are recommended for the **KUAT**, tested with large clips set at 42 cm and 47 cm heights from the board, depending on the harness size. Care must be taken because the large clips height affects the brake position when set at 'normal'.

The regulated distance between the large clips (adjustable at the chest) is 44 cm. Variations of more than 5 cm above these ones will alter the fundamental characteristics of the canopy and are potentially dangerous.

**SOL** give free together all gliders and harnesses, a Measuring Tape to help pilots to check the distance between carabineers.



#### **Attention**

Cross straps may jeopardize flying and do not improve safety.



## KANGAROO 4 - Flight

### Takeoff Weight

The **KANGAROO 4** has been certified for a defined weight range. If your weight range falls between two sizes, we recommend the following:

- If you desire better speed, accurate commands, and if you usually fly over mountains and/or extreme conditions, you should choose to fly near the middle to maximum suggested weight.
- If you desire a better sink ratio, and if you usually fly above flat elevations, and light conditions, you should choose to fly near the minimum suggested weight.

### First Flight

A careful First Flight is necessary with every paraglider, the **KANGAROO 4** is no exception. This flight must take place on a practice hill. After unpacking the paraglider and laying out it in a horseshoe shape position, the following steps must be taken:

- The paraglider must be laid out in such a way that, when tension is applied to risers 'A', the canopy center should be extended before the extremities. This allows for an easy takeoff with good directional stability.
- Special attention must be taken to the wind's direction upon the lifting of the canopy, so that the two halves are inflated symmetrically.
- All lines must be organized and completely free of any entanglements. Special attention must also be given to the lines 'A', which must be free right from the risers 'A' (with the red mark) to the canopy.
- Same priority and care must be given to the brake lines, which must also be completely free and without any possibility of entanglement on any obstacle during takeoff.
- All lines should be checked and all the risers in appropriate order. When the risers are aligned and not twisted, the brake lines will be free from the pulleys (on the rear risers) to the canopy's rear edge.
- It is extremely important that no entanglements nor bunched lines are present.
- Any line going under the canopy or tie may result in disastrous consequences.
- Before and after each flight the lines, risers and canopy must be checked for any possible damage.
- In case there is any damage present, as insignificant as it may be, the canopy should not be flown!

### **Attention**

It is not advisable to fly the **KANGAROO 4** in rainy days or with a wet paraglider, since the in-flight maneuvers become more sensitive and a reserve deployment may occur upon exiting a B-Stoll or in the event of excessive usage of breaks.





### **Takeoff Pre-flight Checklist - DO NOT FORGET**

- Make sure reserve is OK! Opening device and pins activated?
- Helmet?
- Carbines closed?
- Harness – Connected all Locks closed?
- 'A' risers in hands?
- Untangled brakes in hand?
- Are you in the center of the canopy?
- Takeoff path is clear?
- Paraglider and pilot aligned with the wind?
- Airspace ahead of takeoff area is clear?
- Distance between carbines is correct?

### **Takeoff**

#### **Forward Takeoff**

It's very easy to fly the **KUAT**. When ready to takeoff, the pilot must take risers 'A', 'A1' together with the toggles. In order to differentiate between the lines, line 'A' and risers 'A' inclusive are marked with a different color.

Before takeoff, a last check is required to ensure all the equipment is laid out properly. The arms must be extended to the side, as if they are extensions of risers 'A'. A decisive run allows for a quick and stable inflation. Canopy overtakes are not common. After the initial inflation momentum, the pilot must keep the tension forward on risers 'A' (pushing them ahead, and not pulling them downwards), until the canopy is above your head. At this point, the brakes must be carefully activated, ensuring room for the possibility of directional changes. A move to underneath the center of the paraglider is the best method for corrections, provided there is room for it. The pilot glances at last upwards to ensure the canopy is properly located above, completely unobstructed and inflated. At this point, the pilot decides whether or not to takeoff.

#### **Reverse Takeoff**

Reverse takeoffs in strong wind conditions are also very easy to execute. Due to risk of takeoff with entangled lines (twist), it is highly recommended to take some time and practice reverse takeoffs on a small, leveled hill initially.



### **Installation of tow release and auxiliary adaptation**

The **KANGAROO 4** can be used for towed flight as long as it is connected to the towed flight system (Tow release). It must be connected to the same carabineers that join the harness with the paraglider. It is activated through an activator that is strategically located and when it is pulled it releases the equipment to fly. During the taking off it's necessary to avoid a small angle of the cable with the ground.

A taking off with tow release help needs instructions and appropriate procedures. Make sure that you have the necessary knowledge and that the operation is made in a safe and correct way.

### **Performance**

The **KANGAROO 4** in its normal flight, performs better with the hands lifted, applying 25 cm the canopy enters safely the minimum speed range. In order to accelerate (6 - 8 km/h) use the Trimmer. If you apply 52-55cm (trimmer closed) ou 62-65cm (trimmer open) on the brakes the glider will stall.

### **Thermaling and Soaring**

In turbulent conditions, the paraglider must be flown with the brakes softly applied. An increase in angle of attack is achieved by this measure, resulting in greater canopy stability. The pendulum effect back and forth must be avoided! The canopy must remain on top of the pilot. For this purpose, the speed must be increased by releasing the brakes upon entering a thermal (depending on its intensity) or braking on exit. This is part of the basic technique on active flying. During flights over the lift, it is highly recommended a minimum height of 50m be kept, for safety reasons.

It is extremely important to know and respect flying regulations, especially so when the airspace within close proximities of canyons is shared among several pilots, where last minute anti-collision maneuvers are not executable.

### **Turns**

The **KANGAROO 4** is very sensitive, responding instantly to turn commands. Leveled turns can be achieved with the shifting of weight on the risers with minimum altitude loss. A combination of weight shifting and breaking technique is the most efficient way of executing turns in any situation. The given brake utilized determines the radius of turns.

By activating the brakes on the outside edge of the turns, as well as applying maximum weight shifting on the risers, the efficiency and resistance to collapse in turbulences (at the edge of thermals) is increased.

In case it becomes necessary to perform turns in a constrained space with the **KUAT**, we recommend you to release the outside brake in the given turn and pull a little more the brake on the inside of the turn.

The **KANGAROO 4** glides best when no brakes are applied.



### **Attention**

By pulling either brake too strongly or suddenly, there is a danger of creating a negative spiral!



### **Accelerated Flight**

It is recommended to use the accelerator when flying against the wind or in descending current zones. Due to a decreased angle of attack, the canopy may collapse easier than when set at the normal position. The pilot must remember that the higher the speed, the more dynamic the collapse response or symmetric closing will be.

### **Flight in turbulent conditions**

In turbulent conditions it is not recommended to fly the glider with full speed, cause the **KANGAROO 4** is than more sensitive to deformation and closing. The pilot must remember that the higher the speed, the more dynamic the collapse response or symmetric closing will be.



#### **Attention**

The **KANGAROO 4** requires active flying in turbulences! This can avoid canopy closings and deformations.

### **Active flight**

For best performance during your flight, it is important to be always sensitive to what your canopy is trying to communicate. The key elements of active flying are the advancements and tension control.

When the canopy moves ahead of you, carefully apply the brakes, so that the canopy returns to be above you, and if the canopy moves behind you, you must release the brakes.

Flying with the brakes lightly applied (+ - 20 cm) allows the canopy to fly slightly behind. In turbulent circumstances the internal paraglider tension may change, which you will feel on the brakes. The idea is to maintain a constant tension, and in case you feel loss of tension, apply the brake.

These adjustments will make for a more controlled flight, and help in eliminating the possibility of collapse.

Avoid flying excessively with the brakes on because you might brake to the point of stopping the canopy from flying. Always consider your aerodynamic speed. Your movements can be symmetric or asymmetric and both or one brake can be applied.

We suggest that you do ground practice runs and advancing simulations. Tension loss can be simulated well on the ground.

#### **Attention**

Neither pilot nor any paraglider are immune to collapses; therefore active flying will decrease the chances of happening. When flying in turbulent conditions, be more active and avoid great advancements of the canopy by anticipating yourself too quickly with your response movements. Always maintain altitude awareness and do not get into excessive commanding mode. We advise you to maintain brake tension and avoid flying in extreme turbulent conditions.



### **Landing**

It's very easy to land with the **KUAT**. The final approach stage must be done in straight line upwind. During this final glide, the paraglider must be decelerated slowly and at about 1 m from the ground the pilot must stall the canopy, according to the conditions.

With a strong nose wind, the pilot should break only slightly or eventually don't even brake at all, and utilizing just the risers 'C' to de-inflate and overcome the canopy after the landing. By breaking during a landing in strong wind conditions, you may expose the canopy to the wind, which could lead to the pilot being dragged backwards.

The final approach must be done always in a straight line. Sharp and alternating turns may produce a dangerous pendulum movement close to the ground.

### **Motorized Flight and Acrobatic Flight**

The **KANGAROO 4** has not been designed for motorized flight, or acrobatics. Although it has been successfully used for these purposes by some pilots.



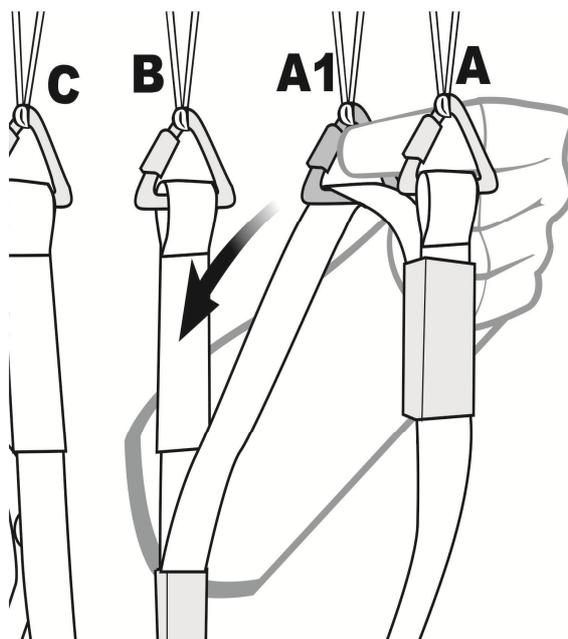
## KANGAROO 4 - Fast descent maneuvers



### Warning

- All fast descent maneuvers must be executed in light conditions and at sufficient altitude, so that they can be performed as necessary under extreme flying conditions.
- 'Full Stalls' and negative spirals must be avoided, regardless of the paraglider being flown. Incorrect recoveries and exits can result in disastrous consequences.
- The best flight technique is to fly safely and correctly. This way you will never need to descend rapidly!

### Ears



By pulling simultaneously the external riser 'A1' at about 18 cm, the canopy tips will close. The canopy remains completely maneuverable through the activating of unilateral brakes or the shifting of weight towards the risers, flying at a fast descending rate (up to approximately 5m/s). In order to recover, the pilot must release the external riser 'A1' lines. Usually the canopy re-opens by itself, but the pilot can assist with a long and quick pumping.



### Warning

**SOL** does not recommend combining of ears and spirals, as this may exceed the allowable load.



### **Positive Spiral**

When the pilot activates just one brake, slowly and progressively, the **KANGAROO 4** inclines sideways in a sharp angle and enters a steep and quick turn, which may become a positive spiral.

During a spiral the rotation radius can be controlled by the greatest or smallest force applied to the inside brake. In order to come out of it, the pilot must release the brake slowly and shift his/her weight lightly to the outside of the turn. A sudden exit may result in an exaggerated momentum forward of the canopy, and collapsing it. For this reason, on exiting the last turn, the inside brake of a given turn must be softly applied again.

In case the canopy collapses during this process, the spiral must be counter-acted, as the active canopy area will be reduced.

Spirals carry a high rate of descent. Therefore high accelerations (G) make it impossible to hold them for an extended period of time. The spiral force may cause the pilot to faint and to lose flying controls, and crash. Furthermore, they will exert a lot of force and affect the pilot and equipment alike.

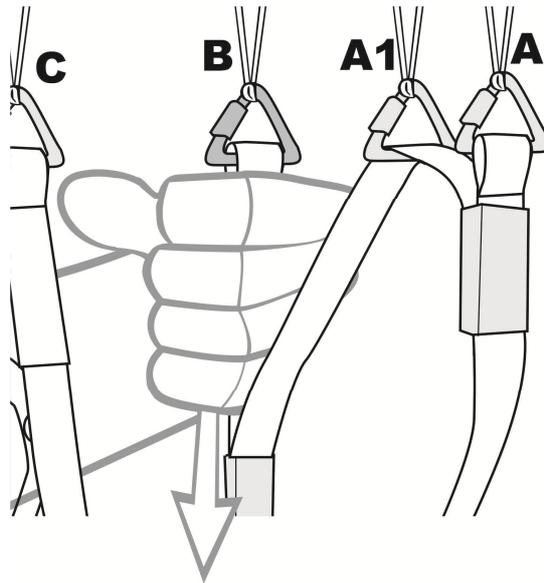
The pilot should never exercise this maneuver in turbulences or with wide lateral angles. In windy conditions, the pilot must be aware of oscillations during the maneuver.



### **Attention**

- Never combine ears with spirals. The canopy active area reduction plus the 'G' force, by the centrifugal effect, may result in line and/or canopy damage.
- Exiting of any spiral at great speeds must be piloted.
- This maneuver requires high altitudes (at least 600 meter over ground) and is dangerous due high descent ratio pilot can lose the altitude reference. Never do this maneuver without sufficient experience.



**B-Stall**

To induce a 'B-Stall', the pilot must pull the risers 'B' simultaneously, between 15 and 20 cm. There will be a shift of air flow on the outer layer and the canopy will initiate a parachutal phase. By releasing the risers 'B' quickly the airflow recoils on the outer layer and the canopy returns to its normal flight position. In case the canopy does not recover to normal flight, refer to the section on Wraps. The momentum of return creates a forward motion by the canopy. We recommend avoiding braking the paraglider eliminating the possibility of a parachutal stall. The load applied on the 'B' lines during this maneuver is not beneficial to your paraglider. Use this maneuver only in emergencies. In the event risers 'B' are pulled too quickly or too deeply, a horseshoe may occur towards the front. In order to regain normal flight, the pilot must apply the brakes lightly.



## KANGAROO 4 - Behavior in extreme maneuvers and collapses



### Attention

Extreme maneuvers must be executed under the supervision of a qualified instructor, on safe courses and with the entire infrastructure available for above ground and water flying!

### Lateral Asymmetric Closing

Like any other canopy, a negative angle of attack will result in a closing. In order to maintain directional control upon a lateral asymmetric closing, the brakes must be applied on the open side.

In case of a major closing, the amount of braking must be well graduated, in such way to avoid the airflow displacement (stall) on the open section of the canopy.

To facilitate the canopy re-inflation during a collapse, the steps above must be followed in conjunction with a long and slow brake pumping action (2 seconds) with the toggle on the closed side. The shifting of weight on the opposite side riser of the closing will also assist with the re-inflation and increase safety, requiring less brake action and keeping away from the stall point.

In case the pilot does not compensate with the brakes, the **KANGAROO 4** in most situations will inflate by itself even in major asymmetric collapses. The **KANGAROO 4** can make a complete turn and in the event it does not open on its own, without action, the paraglider will begin a positive spiral. The pilot must lightly apply the brake on the external side to stop a spiral and at the same time shift his/her weight on the same side until the canopy is stabilized. Exactly at this stage of pendulum effect under the canopy, it is important that the pilot controls carefully the amount of force applied on the brakes, and often it is needed to decrease the force. Once a straight flight is achieved, the closed side can be re-inflated by the pumping action.



### Attention

If the pilot does not actively terminate the spiral, it will continue all the way to the ground!



### **Line-Over**

In the eventuality of lines going over the canopy during flight, the pilot must take the following steps:

- Try to maintain a straight flight: Shift the weight to the open side of the paraglider and assist with a light brake tension on the open side.
- To re-open: Pull the stabilizer line on the closed side (first line of riser 'B' of a different color) until the line entanglement is cleared.
- If the line-over is serious, if it's not possible to maintain a stable flight (spiral) and if there is sufficient altitude (>400 m), there is a chance of resolving this mal-function by executing a 'Full Stall'.

In case the above maneuver does not solve the problem, or if the altitude is not sufficient, the pilot can activate the emergency parachute (reserve).



### **Attention**

Line-overs are generally the result of poor preparation before takeoff, collapses during acrobatics or lateral asymmetric closings.

### **Frontal Symmetric Closing**

Risers 'A' and 'A1' are tightly pulled until a complete closing of the Leading edge is achieved, then quickly release the risers until it is closed. The pilot should not hold the risers after the closing. Special attention must be given to ensure enough altitude is available.

The **KUAT**, on most instances, recovers on its own from a frontal asymmetric closing.

In turbulent conditions, a head butt may occur, which must be overcome by accurate brake control.

### **Parachutal**

The **KANGAROO 4** does not have parachutal stall tendencies and recovers on its own from an intentional parachutal stall induced by braking commands. In the event of a parachutal stall upon coming out of a B-Stall, it is enough just to pull the risers 'A' downwards or the accelerator, thus reducing the angle of attack, therefore reorganizing the air flow contact to the canopy.



### **Full Stall**

To create a 'Full Stall', the pilot must pull both brakes to the end, and hold them tightly in this position. In this situation, the **KANGAROO 4** flies in most times on reverse, in a forward horseshoe shaped tie. The canopy must be stabilized before the procedure for normal flight re-entry is initiated. Any attempt of recover during the beginning stages of a stall, when the paraglider reverses suddenly can result in a sudden push forward of the canopy.

When recovering from a 'Full Stall', both brakes must be released slowly simultaneously and symmetrically ( $> = 1$  second). The **KANGAROO 4** will move forward gradually and begin normal flying.

An asymmetric recovery (releasing one brake before the other) of a 'Full Stall' is utilized only by test pilots to simulate a paraglider being expelled out of a thermal and must not be attempted by pilots!

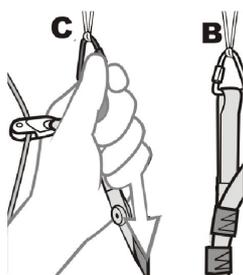
### **Negative Turns**

To induce a fast Negative Turn out of normal velocity (LTF) or starting from the minimum speed (EN), the pilot must pull tightly and quickly one toggle right to the end of it.

During the negative spiral, the canopy rotates relatively fast around its center, with its inner side flying backwards.

When entering an unintentional Negative Turn, the pilot must recover as soon as it is noticed by releasing the brake slightly so that the canopy will accelerate and returns to a stable flight, without losing too much altitude.

When a negative turn is intentionally prolonged, the **KANGAROO 4** accelerates forward asymmetrically. A frontal asymmetric closing should not be under-estimated. To recover from an intentional negative spiral, the pilot must release the pulled brake and pay close attention to a strong canopy surge ahead.



### **Emergency Flying**

In case braking controls are impossible, the canopy can be driven by utilizing risers 'C' and eventually land. Pay close attention to the length of the command, which should be shorter than braking commands.

### **Wingover**

In order to perform a 'Wingover' the pilot must generate a strong pendulum effect by alternating turns on both sides. A complete closing of the canopy is possible.



### **Warning**

A turn with an incline beyond 60° is considered acrobatic.



## KANGAROO 4 - Storage



### Warning

A good maintenance will extend the life of your **KANGAROO 4** for many years to come.

### Storage

The paraglider must be stored dry, in a dry place, protected from UV light and away from chemical products.

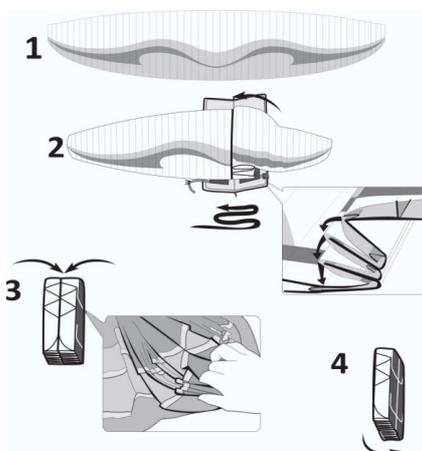
### Backpack

Your backpack was designed with comfort and practicality in mind. It's format allows for good content distribution. Shoulder straps and back support are padded so that comfort is not compromised during walks. For larger equipment capacity, your backpack has an expandable compartment, which can easily be enlarged without sacrificing the layout. Two different pocket sizes at the front allow for easy storage of small articles.

### Folding

By following each step properly, you will be helping to preserve the life span of your equipment:

- Open the canopy completely on the ground.
- Place all the lines spread by the inner layer and risers in the middle outside the canopy on the trailing edge.
- We recommend folding your paraglider like an accordion. This will keep the profile reinforcements (Mylar/Carbon) from being crumpled and/or folded. By using this folding method, the paraglider will keep its takeoff and flight characteristics for longer.
- Keep folding to approximately 50 cm.
- Remove all the air by sliding your hand from the trailing edge to the leading edge.
- Make sure the volume is a little smaller than the protection bag.
- Avoid multiple folds at the same place.



### Steps:

1. Open the canopy completely.
2. Packing the glider "accordion wise" as show in the figures.
3. Place each profile reinforcement over the corresponding cell.
4. Bring together the two parts and roll the canopy up without compressing too strongly.



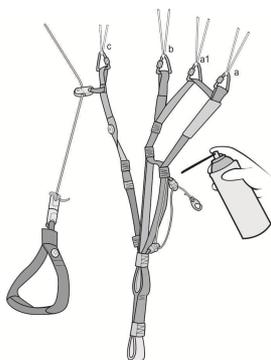
## Kangaroo 4 - Maintains

### Cleaning

Cleaning must be performed only when it is absolutely necessary. We recommend the use of water only with a smooth sponge or cloth. Do not use any chemical product, since it will damage the material permanently.

### Inspection and repairs

The first inspection check is mandatory completing 24 months or 100 flights, whichever comes first. After the first inspection any wing has to be checked yearly or at each 100 flights, whichever comes first. In any of these inspections may occur that a shorter period of time for the next inspection will be defined (f. ex. 6 months or 50 flights). It is of utmost importance to follow these guidelines. Without performing the mandatory inspections, the paraglider loses its certification and the respective **SOL** warranty becomes null and void. A manual for inspection is available for authorized personal.



### Pulleys

It is important you keep pulleys lubricated because in case they do not work may consume the speedy handle or axle, apply paraffin or lubricant spray, read carefully about the lubricant to avoid spots and fabric consume. Do not apply on the sewing lines.



### **Attention**

When buying the lubricant make sure that this product do not attack the material properties. This may affect the fabric and lines resistance.



### **Recommendations for a long life**

The **KANGAROO 4** fabric is made mainly out of Nylon, which like any other synthetic material is sensitive to UV light radiation, causing it to decompose, losing its mechanical resistance, and thus increasing its porosity. For this reason, the unnecessary exposure to sun light, which carries a high UV radiation level in high altitudes must be avoided. It is highly recommended to leave the paraglider stored away and well protected when it's not being used.

The **KANGAROO 4** lines are made of a Technora, with a Polyester cover. Individual line overloads beyond the normal range in flight must be avoided, because an excessive deformation of the line is irreversible, and becoming permanent. The same way, folding and creasing the lines must be avoided, specially the main lines. Never step over the lines or canopy, above all on hard surface. The canopy must be opened only on a clean surface area, since dirty can penetrate in the canopy's fiber, shorten the lines or spoiling the fabric. The lines must be kept from any entanglements on takeoff to prevent excessive deformation.

Avoid storing the paraglider for long periods in areas with high humidity or heat, this causes premature aging of the materials. Keep away sand, stones or snow from entering the canopy cells because any weight on the trailing edge slows the canopy down, possibly creating a stall, furthermore, sharp corners may cut the fabric.

During takeoffs and landings in windy conditions, a run-away canopy may hit the ground strongly and the shock may rupture the material. In case of line entanglement the brake lines may peel-off or a main line may get cut by a brake line, due to friction.

On landing, avoid letting the Leading Edge fall forward and downward towards the ground because this may damage the materials that form the front of the paraglider and/or rip the sewn areas. The manipulation of the paraglider during ground takeoff, or a lot of wind speed up the aging process of your equipment.

After a tree or water landing, the lines must be checked and tested. In case of salt-water contact, the paraglider must be soaked and washed with fresh water. Salt water might decrease the lines' resistance even if soaked with fresh water. The lines must be changed after contact with salt water. Never dry the paraglider directly under the sun. This must be done in a shaded area. After drying send the paraglider for inspection to the manufacturer or distributor.

A Line Plan can be found in this manual or can be obtained with the manufacturer or distributor.

After an accident or long time without using the paraglider must be checked. It is recommended that the canopy should not folded in the same symmetric position in relation to the center, this way the center cell will not be always exposed, therefore keeping the central cell from fatigue overtime.



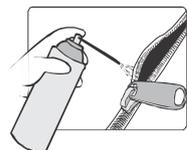
#### **Attention**

Your **KANGAROO 4** was designed, tested and certified to perform the best. Any alteration of your paraglider will nullify your certification and jeopardize your safety. For these reasons we strongly recommend you to avoid altering anything on your paraglider.



## **Kangaroo 4 - Repairs**

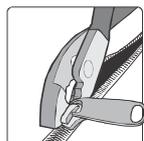
Always check your equipment after an incident or in case the canopy has been stored for a long time. Repairs must be performed only by the manufacturer, distributor or authorized personnel. Minor repairs could be handled by yourself, although we recommend that repairs should be performed by the manufacturer or authorized personnel.



### **Zipper**

The backpack zipper must open and close softly. If there is any difficulty to move it you must apply paraffin or a spray lubricant to diminish the attrition among the components. You will notice the difference when you move it.

It is possible most of the times you fix by yourself the zipper. In case it does not close any more just pull it until the beginning of the position and with a pliers press both sides of the zipper.



### **Tears**

Along with your kit you get small adhesives for repair. Small tears up to 10 cm away from the line points may be fixed by you. Beyond that we advise you the maintenance be made by the manufacturer or by the registered workshop.

- Clean the spot where the adhesive will be applied with a humid cloth.
- It must be at least 2,5 cm more of the adhesive than the tear.
- Make the edges rounded to avoid to unglue after is glue.
- Apply on both sides of the tear.

### **Line breakage**

Along with your kit you get a 1.1 thickness line to make a little repair. When you repair we advise you to sew the unsowed point after you check the measure. Do not knot because it may diminish up to 80 % of the line resistance.

### **Sealing**

Along with your kit you get sealing for the carabineers. Do not leave your risers without them because they avoid the movement of the screw nut making it impossible their opening.

## **KANGAROO 4 - Nature, environment and Out of use**

Please fly in accordance to preserve nature and environment.

If your glider gets out of use remember it cannot be recycled. Please give it to your distributor or your flying-school, they should know how handle it.



## **KANGAROO 4 - Warranty**

Every paraglider manufactured has a Warranty of **3 Years or 300 Hours** of Flight, whichever comes first.

### **Warranty Terms**

1. This warranty is defined as repair or substitution of the defective paraglider parts determined by the producer.
2. This warranty is valid for all **SOL Paragliders** with LTF, EN or AFNOR certification, rated for leisure use only.
3. This warranty does not include paragliders rated for professional use (school, competitions, aerobatics, etc).

### **Warranty Pre-requisites**

1. A three-copied filled-out form: One copy to be sent to **SOL Paragliders** within 30 days after purchase; one copy to the sales person and one copy to the purchaser.
2. All flights must be logged providing information on date, place and length of flight.
3. The equipment must be kept in accordance with the instructions provided in this manual. All the storage, folding, cleaning and care instructions must be carefully taken.
4. Maintenance and inspections can only be performed by the manufacturer or authorized shop and must be properly documented.
5. The first inspection check is mandatory completing 24 months or 100 flights, whichever comes first. After the first inspection any wing has to be checked yearly or at each 100 flights, whichever comes first. In any of these inspections may occur that a shorter period of time for the next inspection will be defined (f. ex. 6 months or 50 flights). It is of utmost importance to follow these guidelines. Without performing the mandatory inspections, the paraglider loses its certification and the respective **SOL** warranty becomes null and void.
6. All shipping and handling expenses are paid by the owner.
7. The corresponding equipment has to be sent to **SOL Paragliders** in the following way:
  - a) Accompanied by a copy of all inspections and a log of all flights.
  - b) Accompanied by a copy of the **SOL Paragliders** warranty form.



**This warranty does not cover**

- Any alterations on original fabric colors, lines and risers.
- Any damage caused by chemical products, sand, friction, cleaning products or salt water.
- Any damage caused as a result of errors during operation of the Paraglider, incidents or emergency situations.
- Any damage caused by inadequate operation of the Paraglider.
- Paragliders that may have been subjected of any alteration from the original design and without proper permission from **SOL Paragliders**.
- Damages caused by inappropriate transport, storage or settings of the paraglider.
- Damages caused by the use of not compatible components with the paraglider.
- Damages caused by the use of inappropriate packaging for the transport.
- Paragliders without original identification label and serial number.
- Handling inadequately to the instructions given in the owner's manual.



## Final words

Safety is the major theme of our sport. In order to fly safely, pilots must train, study, practice and be alert to the dangers around us.

In order to achieve excellent safety levels, we must fly regularly as much as possible, don't go beyond our limitations and avoid exposing ourselves to unnecessary dangers. Learning to fly is a slow process and takes years, so don't pressure yourself. If conditions are not favorable, keep your equipment stored away.

Don't overestimate your skills and be honest with yourself. Every year we see many accidents which in most cases could be prevented with a minor adjustment.

We are a part of the community in which we live: friends, family and even people we don't necessarily know worry about us. Our obligation towards this community is to keep ourselves healthy and that at each landing we will be one landing happier than before. We fly so that we can feel more alive.

We wish you good and safe flights with your *Kangaroo 4*.

*SOL Paragliding Team*





**Meet our accessories:**



**Harness Split Pilot 3**



**Harness Split Passenger 3**



**Harness Tandem Bi Lord**

**Spread Bar**



**Reserve Savemax  
36 CD / 40 CD / 64 CD**



**Front Instruments Container**

**Carabiner Fly Alu.**



**Glove Sol Insulate**

**Glove Sol Neo Red**



**Quick Pack Express**



**Folder Bag Origami**

*[solparagliders.com.br](http://solparagliders.com.br)*

