

# X-CURVE

## Operation manual





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## 1. Forword

Dear Customer,

Thank you very much, that you have decided for a **X-CURVE**. You have not only acquired one of the most modern and innovative rescue equipment, you also opted for a brand that is committed to the sustainable use of the earth's resources. The ecological balance of our products is our priority.

As probably not much before we dealt with the development and construction of rescue equipment in general and dealt in particular with the Cross canopy and steerable rescue equipment. Dozens of prototypes, hundreds of test airdrops and measuring flights have enriched our experiences and sharpened insights. The product of this unique history is a unrivaled light steerable rescue equipment, such as the **X-CURVE!**

The use of a rescue system is complex and it requires some practice to complete a successful rescue deployment. For this reason, I recommend intense workout for the use of the **X-CURVE**. A perfect way for those who can learn only by themselves by repeating the exercises in the event of an emergency in the prevailing difficult condition and react correctly.

I naturally hope that the **X-CURVE** must be used as little as possible. If nevertheless, the situation requires it, it should not be hesitated and the rescue device should be activate immediately. For this rare moments we have invested all our knowledge and our intelligence, so you can count completely on the reliability of the **X-Curve**.

I wish you much success and joy dealing with the **X-CURVE!**

*Dani Loritz*

**Team X-dream Fly ...  
... live your dream**

## 2. Introduction

### **Safety instruction**

The steerable canopy X-CURVE is a parachute to be released by hand for paraglider pilots who are in an emergency situation. Due to their design characteristics it is not suitable for free-fall! The parachute, the suspension lines and their connection are not designed for an abrupt opening, because the necessary shock absorbers are missing. An unauthorized use is prohibited. It is essential to ensure the proper installation of the X-CURVE in the harness. In the direct connection, a compatibility test must be carried out by an entitled person, to exclude possible non-compatibility between the harness and rescue device. Only a correctly mounted rescue equipment can function properly in case of an emergency and thus contribute to safety. In case of a release of the rescue device above water, for example, as part of safety training, should pay attention to the fact that a harness foam protector generates positive buoyancy and can bring the pilots in the „head-down“ position in water. There is also the risk that the foam protection soaks water during a longer stay in the water and then pulls the pilot down.

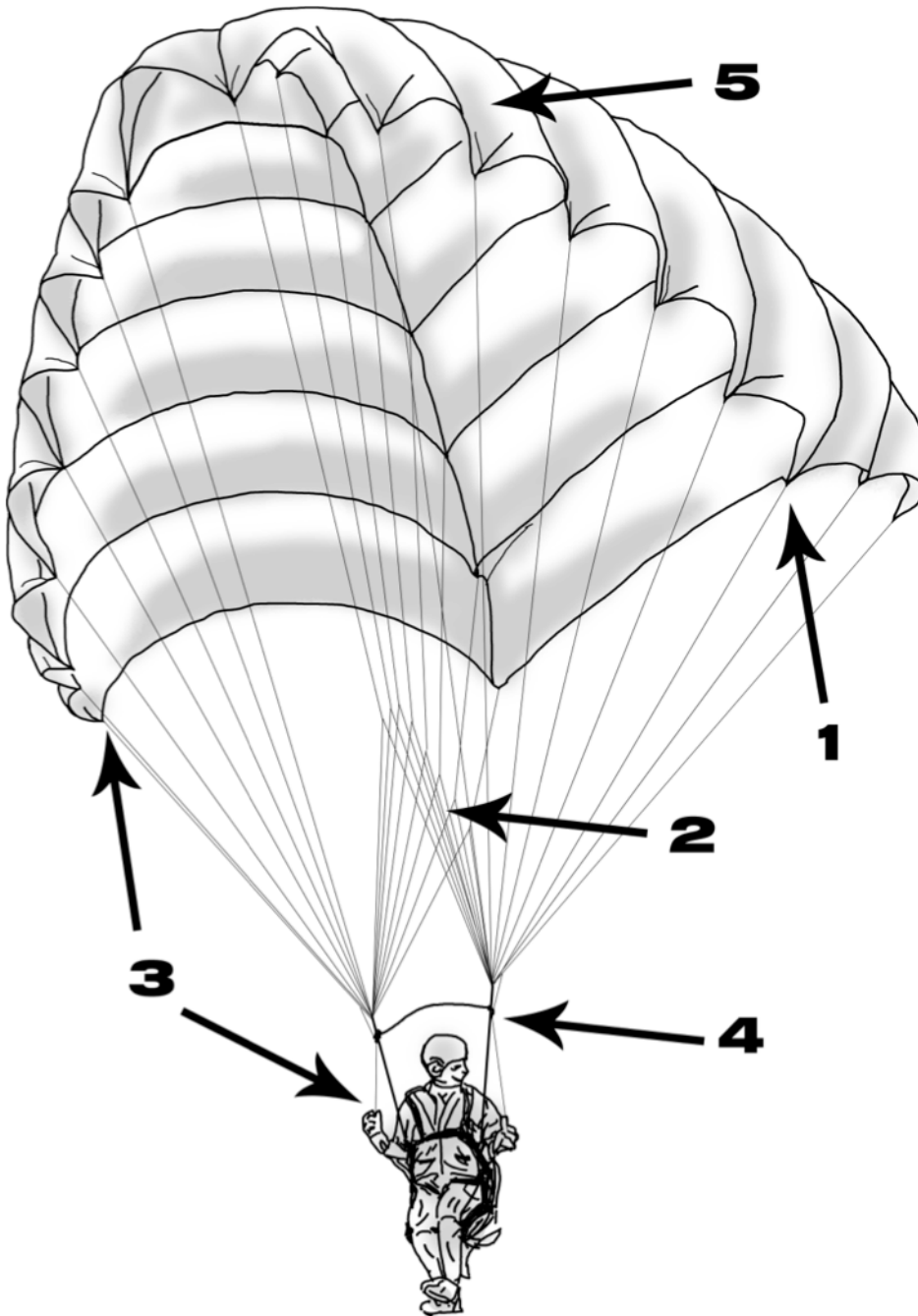
### **Intended Use**

This rescue device has been developed and constructed exclusively for the paragliding sport.

## 3. Rescue canopy X-CURVE

Through intensive research work, we managed to develop a steerable rescue with maximum reliability and strength and fastest opening time at low sink rate. The X-CURVE is easy to pack with a small packing size, low overall weight and a very high pendulum stability. Despite a high maximum weight load we could achieve a very low sink rate. The X-CURVE is suitable for any aspiring pilot and is for acro and XC pilots the measure of things. The compact size ensures the compatibility with most harnesses. We got 2 brake-steering handles just above the connection loop which makes it easy to steer and stay under control even in difficult conditions and wind. Especially in situations where pilots with a normal „round canopy“ can not avoid obstacles, the X-CURVE shows their strength.

## The construction



Legend:

1. sidelines
2. middlelines
3. steeringlines
4. riser
5. canopy

We use only the highest quality materials such as Cousin-Trestec lines or Liros and nylon Fabric from UTT in order to achieve a unique product. All materials used are manufactured in Europe. Sophisticated and modern production methods after ISO 9001 guarantee the best quality and long life. Due to the low pack size the compatibility is guaranteed with most harnesses.

### Specifications:

	<b>X-CURVE 130</b>
Max. load [kg]	130
Number of panels	16
Weight of the parachute [kg]	ca. 1,7
Surface [m <sup>2</sup> ]	37,4
Number of lines	18
Number of middle lines	9 x 2
Sink rate at max. load [m/s]	3,1 - 3,5
Test method	LTF/EN
Pattern test number	LTF RG074.2013
Container dimensions [cm]	L25/B23/H12
Volume [cm <sup>3</sup> ]	5300
Height [m]	6,67
Max. wind loading [kg/m <sup>2</sup> ]	3,48

### Necessary documentation

- Operation manual
- Inspection record

### Components of the delivery

- X-dream Fly X-CURVE rescue
- X-dream Fly X-CURVE inner container (tube container or 4-leaf container)
- X-dream Fly X-CURVE pack instructions (in the operations manual for free download)
- X-dream Fly X-CURVE inspection record
- X-dream Fly X-CURVE operation manual

The operation manual is available for download at [www.x-dreamfly.ch](http://www.x-dreamfly.ch)

## Quality assurance

The X-dream Fly rescue devices go through a step by step control during the whole production. After every step, the product is accurately checked and only after a successful pass of the test the following step will be started. The fabric, the straps, lines and also the sewing machines are verified before use. Continuous quality controls of the production process ensure an error-free production. Each rescue unit is subjected to a strict final inspection before it leaves our factory.

## Materials used

The materials used were selected very carefully and under the strictest quality standards. So we choose a 27 g uncoated rip-stop nylon fabric from UTT. This meets the required strengths, convinced by good workmanship and promises a longer life. The main seams are including a webbing (X-ONE-120 and X-ONE 160), which enhance the strength of the canopy. The lines are made out of high-strength Dyneema for an enormous weight reduction. Only the middle lines are made of polyester. The connection of the lines to the canopy are also made out of polyester and corresponds to the international parachute workmanship.

## The components

The X-CURVE consists of 4 components:

- the canopy (rogallo-canopy)
- the suspension lines (side and middle line)
- main riser incl. loop in riser
- inner container

## Certification

The rescue device X-CURVE 130 by X-dream Fly are approved by the German airworthiness requirement LTF and EN-12491:2001. The approval is valid only in use with the original X-dream Fly tube inner container or 4-leaf inner container. When using a X-CURVE in the context of a non-original inner container please note the corresponding release note in the appendix of this manual.

## Operational limits

X-CURVE 130 Certification LTF = 150 km/h = 41,6m/s. According to EN 12491 rescue equipment is not suitable for use at speeds greater than 32 m/s or 115 km/h.

Every 12 months the X-CURVE rescue equipment need to be repacked. It makes sense when you throw the rescue package for training on this occasion in a clean, dry space. Currently, there is no verification requirement for rescue equipment. However, we recommend every 24 months a review of the rescue system. After each case of a real emergency opening the X-CURVE rescue device should be checked by the manufacturer.

Permissible operating time: 12 years in compliance with the pack intervals and storage regulations. An extension up to 15 years is possible after an inspection of the manufacturer.



## 4. Throwing the X-CURVE

The reserve is very often literally the lifesaver the "Second Chance" for paraglider pilots. In the close flown air-space of many flying areas a collision should not be underestimated as a danger on good flying days. Collisions with other aircraft are one of the principal reasons to pull the parachute. Disturbance in the glider as cravats, which leave the glider in spirals, fast twisted rotation movements or line breaks which makes the steering of the glider impossible are other good reasons for throwing the reserve.

### **Deployment of the rescue canopy**

You grab the handle of the rescue and throw the canopy with a strong lively movement slightly backwards. The more hard the movement precipitates, the faster the lines stretch themselves and pulls the canopy out of the container.

### **After the opening**

When the reserve opens (usually behind the pilot) the glider is momentarily unable to fly, any prior rotation stops immediately. The rescue rises above the pilot, the glider dives forward or sideways. Now you must immediately attempt to deform the glider strongly (B- or C-Stall, or pull one line in) that the glider disturbs the rescue in his movements as little as possible. If one does nothing at all, the glider rises above the pilot, the rescue shifts backwards and cannot carry properly. This can occur to the dreaded scissoring position (down plane) when the glider and the rescue are at an angle of  $45^\circ$  to each other. The rescue carries now only one part of the load, the rate of descent is dangerously high. Try to deflate the glider and don't let it fly anymore (B- or C-Stall, pull one line in). If the paraglider flutters only like a flag upwards, the rescue canopy can carry widely undisturbed and freely of pendulum.

### **The scissors position**

The X-CURVE is extremely pendulum stable as a rogallo canopy can be. Nevertheless, the danger of a scissor position (down plane) should be reduced by stabilising or retraction the main glider. A scissor position increases the rate of descent and produce an oblique pilot position when landing and increases the risk of injury!

## Disconnect the glider

To achieve proper operation of a rogallo the rescue canopy should fly without any influence of the main glider above the pilot. A simple and effective way to achieve this situation are quick out carabiners. These carabiners make it possible to disconnect one or even both risers of the glider. We recommend for this reason the use of quick-out carabiners. It is also important when using a speed system this is separated during the separation process as well. The main glider should be only disconnected after the rescue canopy opens proper, inflates fully and fly well above the pilot. The separation of the two risers of the paraglider should never occur simultaneously. Separate first one side of the risers and if necessary the second one. It might be that one disconnected riser is enough to deform the glider to such an extent that he has no influence anymore on the rescue. If one side of the glider is disconnected the flight direction of the rogallo carried on side which is separated. Even in unilateral separation the flight direction can be controlled with the handles of the X-CURVE. An unilateral separation can make sense in certain circumstances, if you fly above forest or inaccessible areas you will not drop your glider. To achieve the maximum forward speed, maximum glide and best controllability of the X-CURVE the glider must be completely separated or pulled in. There is the danger that during installation or during the rescue deployment the rescue turns on its own axis. This has the consequence that the two risers get twisted. Twisted riser on a rogallo canopy have no effect on the opening behavior. However, this may restrict the controllability or make it even impossible. To untwist twists it is necessary to deform the glider or at least disconnect one side of the glider.

## Flying with the X-CURVE

The X-CURVE is equipped with a system which pre-brake the rescue after the opening. This pre-brake is deactivated after the initial pull of the brakes on both sides. A rogallo canopy develop additional buoyancy by forward drive. This is the reason that the sink rate of such rescue equipment compared to cross or circular caps are very small. Missing the forward drive on a rogallo or he is too strong braked, a stall can occur like on a paraglider. The result is a cap deformation, accompanied with a high sink rate. For this reason the pre-brake is restricted on a rogallo canopy. The X-CURVE is consequently traveling forward even in the pre-braked state. A rogallo canopy without forward speed is structurally not possible. The brake-steering handles on the X-CURVE are attached by a velcro band strap on the riser. Pulling on a brake handle initiates a curve. The brake has a limit, thus the brake can not pulled to low. The turning performance of the X-CURVE is attenuated as dub. Rogallos build in the curve no rolling or pitching moment and do not generate dynamics. Simultaneously pull of both steering lines resulted in no significant slowdown. The X-CURVE can not be stalled by pulling both steering lines. We recommend to study and train the use of the X-CURVE in advance. If your rogallo is mounted to your shoulders it can be difficult to turn your head to orientate yourselves to the risers of the X-CURVE. The position of brake handles must be felt. In an emergency we seldom have much time and often is hectic and it is important that procedures are rehearsed and work blind.

situation	sink	forward speed	steering
not disconnected	average   variable	0 - 5 km/h	difficult
one side disconnected	good   stable	5 - 10 km/h	good
both sides disconnected	very good   very stable	10 - 15 km/h	very good

### Landing with the rescue device

Especially when triggered at low altitude the upright position in the harness is important. If you have a shoulder mount to the harness, it usually brings you in an upright position. It is essential to ensure that the glider doesn't deform the rescue device just before the ground.

It is important to note the following when landing on the rescue:

- upright pilot position
- legs together and knees slightly bent
- be ready to roll over yourself

### Potential errors and hazards

error in the deployment	rescue response   hazard	pilot reaction
release handle can not be achieved	rescue can not be triggered	compatibility-check after each complete new installation
closure on the outer container can not be opened	rescue can not be triggered	c-check after each complete new installation
inner container is not thrown away aggressively	rescue does not open or very delayed	strongly pull on the lines or riser of the rescue, pull second rescue

error in the deployment	rescue response   hazard	pilot reaction
no deformation of the paraglider	scissor position, strong commuting, uncontrolled impact	deform the glider, get rid of the glider (Quick-Out)



error in the deployment	rescue response   hazard	pilot reaction
too much concentration on the glider, pilot forget the upright position	pendulum, uncontrolled landing	occupy upright pilot position, prepare for landing
during the landing legs not together, wrong pilot position	uncontrolled landing	Ouch!!!

## 5. Maintenance and inspection of the X-CURVE

Before each packing the parachute must be inspected by a packer. Was the emergency parachute opened for an emergency case then the rescue must be subjected from the manufacturer.

### Behaviour if damaged

If a check at the rescue system found some damage which affect the airworthiness of the device, the rescue equipment has to be send to the manufacturer for repair. This also applies to damages whose impact on the airworthiness of the system cannot be uniquely determined.

### Storage

A rescue device exists to save the life of the owner. It needs careful maintenance and care. UV radiation, moisture and chemicals are the worst enemies of your X-CURVE rescue device. Avoid unnecessary burdens and let your X-CURVE never unnecessarily lying in the sun. The rescue equipment should be dried in clean, dry and dark rooms. Rescue packages that are no longer used should be stored loosely rolled in a bag.

### Cleaning and drying

Dirty canopies and containers can be washed with clean clear water. Acids and mildew can affect the strength of the components. Such polluted parachutes have to be sent to the manufacturer for investigation and repaired if necessary.

### Repairs

The manufacturer or authorized X-dream Fly partners must perform all repairs.

## Correct disposal of the rescue equipment

As an environmentally conscious manufacturer of rescue equipment we pay great attention to produce our products eco social tolerated. The material we use in our products is evaluated according to environmental criteria and subject to constant control. For the proper disposal the steel fittings should be separated at the metal disposal point. The canopy, the lines and straps can be disposed with household waste.

## 6. Attachment to the harness

Each new combination of harness and rescue has to be checked (compatibility check) after the first packing by the manufacturer of the harness or by a trained and appointed person. Deploying the rescue system has to be possible out from each flying position according with the requirements of the building regulation. It should be noted that the release force of 7daN is not exceeded. The X-CURVE must be connected with a carabiner or by looping through the V-line to the harness. When using a connection carabiner the breaking load of the carabiner must have a min. of 2400 daN. If the X-CURVE is connected to the shoulder area with two carabiners or as a front container on two lateral attachment points (usually the front container is mounted on the main carabiners), each individual carabiner need to have a strength of 1200 daN at least.

## 7. Packing interval for the X-CURVE

Before the rescue is repacked it must be subjected to a visual inspection by the packer. The reserve parachute must there fore be aired at a humidity of 60 - 65 % for min. 24 hours. The packing shall be done as possible on a packing table, but at least on a clean, anti static surface. The following photos are from a X-CURVE. We remind you that you fly at your own risk. This also applies to the use of this life-saving device. Preliminary the packing loops get looped in by using the expander tool (from 1-7, 2 loops per hook). This facilitates the further packing of the parachute.

## 8. Packing manual X-CURVE

Before you start to pack, the X-CURVE should be checked for any damage to the canopy, the lines and the main riser. The lines should be checked for proper performance and to unravel if necessary.



*Image 1*

The X-CURVE is laid down symmetrically so that the tip is on top and the lines can be controlled now for correct course.



Image 2

Using the packing tool the rescue can be pulled under tension. At each hook are two opposite pack loops hooked.

Image 3

There are seven numbered hooks on the packing-tool. The hook number 1 is the first which should be mounted to the packing loops on the X-CURVE's top (front). The hook number 7 is located at the rear (end) of the X-CURVE.







Image 4

Now we have to arrange panel by panel to one side. The panels should be as wrinkle free as possible. We start with the lowest panel.

Note that the lines remain pooled on the basis below.

Image 5

Then, on the first side we start to flatten panel to panel. Always try to bring losen material up to the top of the X-CURVE. The first panel is a big triangle ...







Image 6

... the second is a smaller triangle. Ensure on this smaller triangle that the corresponding line has no tension (the only line, left and right, with no tension) This line is the steering line. Pull this line and the connection loop upwards into the direction of the packing tool. This line point should not move during the other packing process. To keep it centered in the line channel during the packing procedure fix it with a slight pressure from above.

Image 7

Now all the other panels from this side should be folded carefully. The panels have a slight diagonal tension. The last panel is the „nose“ of the rogallo.





Image 8

Subsequently, the opposite side of the X-CURVE get folded now. Start from the bottom with the big triangle panel and push all the fabric into the direction of the packing tool.

Image 9

Same as on the opposite side the second panel is a smaller triangle.

Note that the line and attachment loop of the previous panel should be held during the packing procedure of the next panels.





Image 10

After you finished folding the panels on both sides the X-CURVE looks now like a „fir tree“. The panels are now symmetrically on both sides folded.

Image 11

Now you fold panel after panel from one side to the opposite side.





Image 12

Now there is only one side left of the „fir tree”. All panels are now on one side and the line channel is on the other side.

Image 13

All the panels which you just folded to one side you need to fold back (S-Turns) on inner container width.





Image 14

Panel for panel get folded back half the width.

Image 15

All the panels which you folded half way back need to be turned now 180°. All the lines become visible now again.





Image 16

The „fir tree” is now on one side folded backwards.

Image 17

The same procedure is now made on the opposite side.







Image 18

Fold one panel after the next to the side which already have the inner container width ...

Image 19

... and fold it back (S-Turns) on inner container width.





Image 20

Subsequently unhook the packing tool.

Image 21

Fold the canopy in S-Turns from the top to the bottom. The result is a narrow, high tower and the S-Turns should have about 8 - 10 cm width.







Image 22

For these steps are two persons helpful.

Image 23

Pull the inner container from above over the existing tower. The slot of the inner container should look in the direction of the lines.





Image 24

The lines are now stowed in a turn in the last panel of the canopy. The shortest middle line ends on this panel.

Image 25

Fix a rubber band over this line loop. This line loop get stored on one side of the inner container bag.





Image 26

Close the inner container with the lines.

Note, that you start with the middle rubber band that closes first the slot and then the line flap after you close the remaining rubbers. Keep the line loops in the rubber bands as small as possible.

Image 27

The lines are collected in S-Turns so that it results in approximately 2 - 3 leash bundles. Again, take care that the line loops behind the rubber band kept as small as possible.

The remaining line bundles get stored in the line flap of the inner container. Leave around 15 cm of lines to the riser to close the last flap of the inner container.





Image 28

Close the the cover flap of the inner container with a line loop and the last rubber band on the end of the slot.

The X-CURVE is now ready for installation to the harness or in the front container. The connection from the X-CURVE with the harness has to be made following the recommendations of the harness manufacturer (manual harness).

Make sure that you mount the X-CURVE proper and in the right way. There are three loops to connect the handle from the harness to the inner container from the X-CURVE.





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We wish you continued great flights and many happy landings with the X-dream Fly product **X-CURVE**.

**Team X-dream Fly ...  
... live your dream**

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## Release

### **Release of X-dream fly rescue equipment for external containers (harnesses with integrated reserve container)**

**Current status 04|21|2014**

#### **1. Content**

This release is valid for all X-dream Fly rescue equipment, including X-ONE 90, X-ONE 120, X-ONE 160 and X-CURVE 130, in conjunction with non-original inner containers.

#### **2. Risk**

The compatibility of a harness with integrated / solid inner container to an external emergency equipment must be guaranteed by the manufacturer of the harness and is tested by internal tests with different bulky containers. The opening processes of the rescue device are dependent on the type and size of the inner container. There is the possibility that the rescue equipment have a slowed-down opening or not even open in use of a smaller inner container or inner container of other design. The original container of X -Dream Fly have a separate line compartment for the S-loop line packages for a defined opening sequence. In a container without a separated line compartment the throwing power slows down by the early release of the entire rescue system. The X-dream Fly containers provide a maximum of throwing power and quality of defined opening. This ensures a faster opening. In addition, Dyneema lines are installed in most modern rescue equipment. These lines are coated with a polyurethane resin. In the rescue manufacturing (at X-dream Fly) we take care that different materials are handled separately. It is possible that minimal parts of this coating are solved and get transfered on the fabric if the lines and the fabric are packed together. This can lead to bonding and thus a delayed opening. Similarly, a defined packing method is recommended which is not useful or possible in each inner container from other brands. Changes that differ from the original packing method or the packaging size can increase the opening time and reduce the opening quality.

#### **3. Implementation and installation**

The implementation and installation of a X-dream fly rescue unit in the inner container of a third-party may be made only by trained personal by X-dream fly. During the conversion and installation of the rescue the manual of the rescue as also of the harness - or inside container manufacturer - has to exist and the corresponding installation and pack instructions need to be followed. The conversion in the non original inner container is to note in the packing ID and signed by the pack manager.



#### 4. Changes | Pack Interval | Opening Quality

We would like to point out that we pay much attention to a uniform development of our rescue systems. This refers to all system details and also includes the inner container. Who changes the inner container on our rescue equipment or remodels, change the quality of opening under certain circumstances. We definitely recommend a proper release during a compatibility-check. If the lines packed together with the canopy in the container we recommend to shorten the packing interval to 6 months. On the usual precautions (dry storage, no compact packing, no moisture in the system etc.) in the handling of harness, inner container and rescue device should be placed specialempphasis.

The operating manual as well as additional information can be found as download under [www.x-dreamfly.ch](http://www.x-dreamfly.ch)

Bach, 10|11|2014

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