Hang Gliding World Champion

Laminar ZERO-7

Instructions Manual

Rev.2004

Congratulations on buying an Icaro 2000 hang glider! We're certain that you've made the right choice!

Icaro 2000 srl is Europe's leading hang glider manufacturer, constructing hang gliders for almost 20 years, and selling over 7,000 gliders all over the world in the last decade. Icaro 2000's competition and sales record are the envy of other manufacturers…

Icaro 2000 gliders are fully designed and manufactured in our factory at Sangiano –Northern Italy, using only first quality materials. All our hang gliders have German certification (DHV).

With our extensive worldwide distributor's network, you can rest assured that spare parts and service will always be available to you, no matter where you fly. This includes spares for all current and dated models.

Thank you for choosing our hang glider and we wish you great flights!

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Preface

The development of the **Laminar ZERO-7** brings you an easy-to-fly glider with better performance and safety standards.

Since the first apparition of the Laminar in 1994, there have been **several evolution** grades, all wanted by our big Champion Manfred. For who does not recall, Manfred is not only the best pilot in the world but he also is the developer of ALL our ICARO hang glider models.

The model 2004 is at its 7th evolution grade and therefore we decided to call this model the "Laminar ZERO-7".
On the sail there will be the logo: **ZERO-7**

We also decided to **change the initials** which characterize the size of our hang gliders MR. The old numbering could only bring confusion to the wing size. Therefore Manfred decided to coincide **the exact sail surface** with the new initials. This is the result:

The Laminar ZERO7 is available in 4 different sizes:
Laminar ZERO-7 **13.3** -which corresponds to the till now called MR12
Laminar ZERO-7 **13.7** -which corresponds to the till now called MR13
Laminar ZERO-7 **14.2** -which is the new size between the till now called MR13 and MR14. Till today we described this model as the MR 4.2
Laminar ZERO-7 **14.8** -which corresponds to the till now called MR14 (the hang glider with which Manfred has won all 3 World Championships)

In the trailing edge of the MR, the horizontal carbon rod supports 5 battens, and both swivel tips are equipped with a compensator function. On the ZERO-7 the outer tip has a "Twist Tip" function for better handling with ½ VG on. This does not only mean getting great values on the certification tests, but also a significant enhancement of passive safety.

I. Introduction

Over the last decade hang gliding has become much safer. Accidents have been few, due to flight-schools becoming more professional, and certification procedures becoming more demanding. In Switzerland, for example, the insurance risk of hang gliding is the same as for winter sports.
However, hang gliding is an active sport with all the associated risks. Your safety can be greatly enhanced by following a few simple rules:

Keep the risks to a minimum

- Attend a professional school.
- Fly a glider suited to your skills.
- Fly only when the weather conditions are appropriate.
- Be aware of adverse weather conditions; caution is a mark of intelligence not of cowardice.
- Remain current. Try to avoid long intervals between one flight and the next so your flying ability will gradually increase.
- A new risk may arise when you fly a new type of glider the first time. The reactions of your new glider maywell differ from those of the glider you were used to. In order to keep this risk low, we recommend that you gradually become familiar with your new glider and make your first fly in calm conditions

Preliminaries

- Study your manual before your first flight. Practice assembly and disassembly as explained in the manual.
- Always follow the same assembly and pre-flight check routine; do not distract yourself during these procedures.

Assembly check and first flight

- Every authorized ICARO 2000 dealer can test fly your glider -if requested- before delivery: consider asking for it: you'll get your money's worth.
- Your dealer should also help you set up your glider for the first time and see you off on your first flight.
- We strongly recommend speed bar wheels, especially for your first flights.

High flights

- Always wait for ideal weather conditions for your first high flight.
- Experiment with different VG settings: roll reversals, slow flight, high speed flight, and stalls at an altitude of at least 350m (±1000 feet).
- Fly your personal polar with your instruments.

II. Fundamental Rules

- After major repairs, after remounting the sail, or after a long period of not flying, always choose a site to fly from that you are familiar with, and where it is possible to land immediately after take-off.
- Your glider is delivered to you ready to fly. **Do not make any adjustments that are not described in this manual.**
- Periodically check the trimming values shown in the table (Chapter IX).
- Only fly after having attended a good school, recognized by your hang gliding federation.
- This owner's manual does not replace the check done by an authorized dealer. This counts also for expert pilots. Any pilot who is in doubt about any aspect of their glider should consult their dealer, or ICARO, for advice.
- Never fly alone.
- Before every take-off always do both an assembly check and a pre-flight check.
- Don't push your luck! Only fly in places suited to hang gliding. It's your responsibility to know the limits of your glider, and the limits of your own experience.
- Don't attempt towing of any kind, unless you have attended a recognized towing school. Always use wheels on your speed bar when towing.

III. Certification and General Restrictions

Certification

All ICARO 2000 hang gliders have German certification (DHV). Icaro glider ratings according to the German DHV:

- class 1 (beginner pilots) – Laminar RELAX
- class 2 (intermediate pilots) – Laminar EASY
- class 2-3 (advanced pilots) – Laminar 12R, 13R, 13MR, 13MRx,
- class 3 (advanced pilots) – Laminar 14R, 14MR, 14MRx, 13.3 ZERO-7, 13.7 ZERO-7, 14.2 ZERO-7, 14.8 ZERO-7

Wind Speed

- When the wind speed is stronger than 30 km/h (~ 15 mph) take off becomes risky. In these conditions, consult with more experienced pilots before taking off.
- If in doubt, do not fly.

Turbulence

- In turbulent conditions, gusts of descending air can suddenly exert strong negative loads on the glider; such negative loads must be avoided.
- Do not fly in turbulent conditions or on the lee side of a mountain; this is extremely risky in strong winds.

Aerobatic Flying

- **AEROBATIC FLIGHT CAN BE FATAL AND IS, THEREFORE, PROHIBITED.**
- Aerobatic flight includes flying with bank angles in excess of 60 degrees, pitch angles in excess of 30 degrees, whip-stalls, wingovers, loops and spins.

IV. Transport

By Car

Serious damage can be caused to the glider during car transportation; a well-padded roof rack is necessary to avoid damage. For additional safety and support, we strongly suggest you install a front rack on your vehicle.
There are good racks on the market, expressly designed for glider transport; these can be easily assembled on normal roof racks. Ask your dealer for details.

By Gondola or Cable car

To avoid any damage when transporting your glider on the cable car it is advisable to be present to supervise the loading and unloading of the glider.

In Plane

Your glider needs to be thoroughly protected if it is to be transported by plane. Use a wooden crate, or a stiff cardboard tube. Your dealer or ICARO can provide these. Always let the airline know the dimensions and weight of your glider, well in advance.

V. Assembly

There are two possibilities to assemble your LAMINAR ZERO-7 properly.

The glider should be assembled on the A-frame. This method helps you protect your glider in an excellent manner because the sail practically never touches the ground. This avoids scratches or dirt on your sail.
It is also possible to assemble the glider on the ground (flat assembly). This method is only recommended when setting up in strong wind conditions.
Left and right in this section must be taken as in flight position.

Assembly on the A-frame

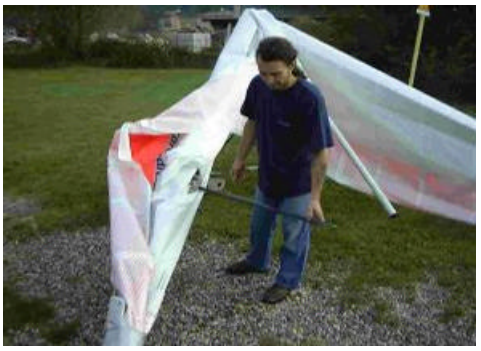
Place the glider on the ground,

- With light breeze: nose into the wind
- With moderate breeze: the keel must be perpendicular to the wind

If the ground where you are assembling the glider is not flat, point the nose of the glider towards the top of the slope.

Start point

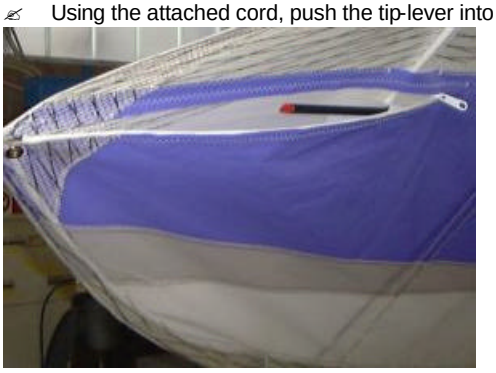
- Open the glider bag, remove the Velcro, lay down the uprights and fix the speed bar with the pushpins and safety rings. **Do not forget the safety rings!** Make sure that the camber of the speed bar faces the nose of the glider.
- Let the VG cord pass through the clam cleat on the speed bar.
- Turn the glider up-side-down and lean it, steady, on the A-frame.
- Remove the glider bag and any remaining ties. Open the wings keeping the end of the wings close to the ground and the tip covers on.
- Position the sprog (The sprog is a tube in carbon with a steel wire placed in the cross-bar junction half-wing, which supports the battens n°6, 7 and 8 on the 13.3 ZERO-7, and it supports the battens n° 7, 8 and 9 on the 13.7, 14.2 and 14.8 ZERO-7; substantially it is a big tip). In order to position the sprog, you need to take the final part of it, the part that is covered and flat, and raise it till it is possible to insert the frontal part in the adapter.

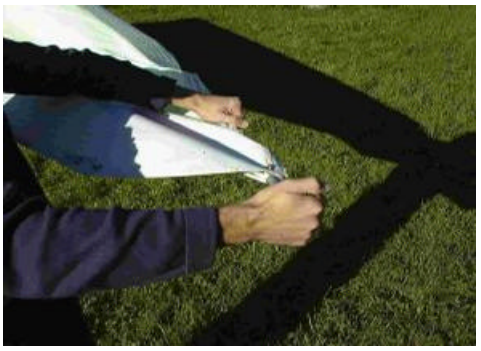


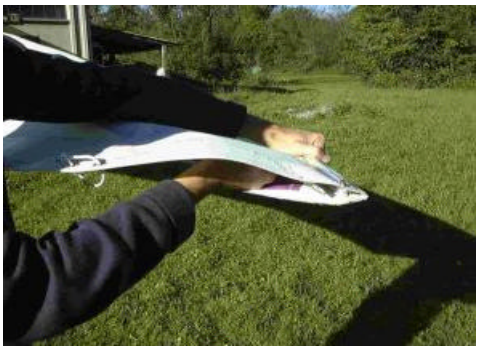
- Make sure that the sprog wire is free and parallel with the sprog; it must not be rolled up on itself! In order to complete the positioning of the sprog, you need to close the zipper of their housing; this needs to be done after having inserted the battens
- Repeat the same procedure for the other wing side.
- Open the wings completely
- Make sure that the VG system is completely loose and that the wings are completely open
- Pull the elastic string, which is on the end part of the keel, till it reaches the handle for tensioning the crossbar and pull it till you reach the small hook plate. Here you fix the elastic to the bolt on the keel while keeping the spring button pressed (on the Laminar ZERO-7, with VG loose, the sail has less tension than on the other versions and therefore it is possible to hook-in the cross bar before inserting the battens. This sequence needs to be followed in order to avoid the compensator tip wires from giving problems while assembling the hang glider).
- Take the shackle to which the front wires are attached to, and fix them to the nose hook of the hang glider. In order to do this, you slightly need to force the nose of the hang glider downwards.
- If the wind is not too strong, you can take out the end of the keel by pressing the spring button and lean the hang glider on the keel end. This makes assembling the hang glider easier.

Mounting the Fiberglas Tips

- Remove the tip cover on the end of the wing and open the wing-tip zipper.
- Insert the shortest straight batten through the zipper you just opened (this batten is made of carbon on all our hang glider models) into the pocket which is parallel to the trailing edge and close it with the Velcro.
- Insert the thick end of the fibreglass tip through the opening of the sail and into the aluminium hole at the end of the leading edge. Push firmly until you hear it hitting against the stopper (clack!).
- Bend the thin end of the tip towards the trailing edge and at the same time position the cap of the tip-lever over it.
- Using the attached cord, push the tip-lever into the sail till it “clicks” against the Fiberglas tip. Now the sail is tensioned.







Warning: Pay attention to your fingers while closing the lever!

- Close the wing-tip zipper. At this stage, the sail may not be flat but slightly twisted. If so, twist the end of the sail slightly to make it flat. Failing to do this could introduce a subtle turn when flying

Note: during these operations the sail needs to be loose therefore follow the instructions.

Positioning the Aluminium tip

***Note**: In the pictures here below you will see the battens already inserted into the sail. It is though necessary and opportune to position the tip before inserting the battens*

- Hold the extreme part of the tip, which is free and which is at the end part of the wing, and rotate it towards the trailing edge till it is brought into the zipper.

- Make sure that the tip wire is free and parallel with the tip; it must not be rolled up on itself! In order to complete the positioning of the tip, you need to close the zipper of their housing; this needs to be done after having inserted the battens
- Repeat the same procedure for the other wing side.

Fixing the Crossbar

- Ensure that the wings are fully open.
- Standing behind the glider, locate the crossbar tensioning bungee at the rear end of the keel. Pull the cord until you can reach the small plate with the lock hole, and secure it to the keel bolt by means of the spring button

Inserting the Battens

Note: do this operation when the tension strap of the cross bar is already hooked-in. Make sure that the VG is completely loose.

- Take them out of the bag and lay them down on the ground
- Start from the centre of the hang glider beginning by the longest one and continue till the end part of the wing ending up by the smallest batten.
- Position them into their batten pocket and fix them on the trailing edge
- Then position the straight battens into the double surface

Note: The number of the battens can vary according to the model of the hang glider.
***Note**: The nose battens can always remain into the sail. No need to take them out when you disassemble the hang glider.*

Final Operations

- It is now possible to close the zipper, both of the tips and of the sprog. The simple closure of the zipper blocks automatically the position of the tips and sprog, thanks to the presence of a ribbon.
- Settle the nose fairing.

- Open the central zipper which is under the keel and check that the T junction, to which the hang strap is attached to, is rotated in perpendicular position to the keel; then close the zipper.

Assembly is now complete: immediately make the assembly check.
ATTENTION: do not lift the keel if the glider is not tensioned, it may damage the nose bolts and plates.

Flat Assembly

Position the hang glider on the ground with the nose in the wind.

Start point

- Open the bag, lay down the down tubes and fix the speed bar with the push pins and the safety rings. Don't forget to put the safety! Make sure that the camber of the speed bar is turned towards the nose of the hang glider
- Let the GV cord pass through the clam cleat on the speedbar
- Turn the hang glider up-side-down and leave it laid on the ground
- Take off the hang glider bag and the remaining Velcros. Open the wings keeping them low on the ground

Note: follow the same steps as for the assembling on the A-frame; therefore go back to page 5.

Final checking

- Position the hang glider on the A-frame
- Take the shackle to which the front wires are attached to and fix them to the nose hook of the hang glider. In order to do this, you slightly need to force the nose of the hang glider downwards
- Settle the nose fairing.
- Open the central zipper which is under the keel and check that the T junction, to which the hang strap is attached to, is rotated in perpendicular position to the keel; then close the zipper.

The assembling is now complete: Carry out immediately the checking of the assembling.

***ATTENTION*: do not lift up the end part of the keel if the crossbar is not completely open, this could damage the bolts and nose plates**

VI. Check list

Before every flight it is mandatory to do a systematic check of the glider.

Assembly Check

Start at the glider's nose. Go counter-clockwise around the glider through all listed locations, opening and closing zippers where necessary to perform the checks. Finish by checking the center and the control frame.
The following points need to be checked carefully:

Nose

- Nose wire is attached.
- Nose fairing fits properly to the leading edge and Velcros
- Bolts and nuts of the nose plate are screwed

Crossbar-Leading edge Left joint

- Crossbar/leading edge connection is secured with the nut and bolt.
- Side wire is in perfect condition and in the right direction.
- Crossbar is not damaged.
- Nuts on the two leading edge bolts are secure.

Left Wing Tip

- The two nut bolts on the leading edge are secured.
- The integrated tip wand lever tensions the sail, and the sail zipper is closed.
- The sail end is flat.
- The floating tip is correctly inserted in the end of the leading edge, and the zipper is closed.
- The swivel tip is mounted and secured by its string. The zipper is closed
- Leading Edge tube is not damaged.

Left Wing Battens

- All upper battens are inserted and secured on the trailing edge.
- All lower battens are inserted and secured.

Rear Keel

- All nuts and bolts on the rear section of the keel are secure.
- Tension plate of the cross-bar is properly secured in place by the spring button.
- Tension strap is in good order.
- Lower rear wires are in perfect condition.
- Detachable rear section of the keel is inserted properly in the main keel and secured by the spring button.

Right Wing Battens

- see above : "LEFT WING BATTENS"

Right Wing Tip

- see above: "Left Wing Tip"

Crossbar-Leading edge Right joint

- see above: "Crossbar-Leading edge Left joint"

Central Section

- Hang strap is not damaged and well secured.
- The spring catch which holds the crossbar secured is attached.
- All nuts and bolts on the central plate of the cross-bar are tight.
- The slide block is tightened in its position by the black belt.
- The nut and bolt that fix the A-frame to the keel is tight and the bolt is not bent.
- Look inside the sail to make sure the main tubes are all right and all bolts are tight.

A-frame - Upper side

- The hanging bolt is not bended.
- All bolts are tightened
- The seesaw connection is perpendicular to the keel
- The zipper is finally closed

A-frame - Lower Corners

- Speed bar is properly attached.
- Pushpins and their washers are in place.

- Both socket head bolts which secure the speed bar knuckles are tight and do not protrude from the nylon block.
- The lateral wires are inside the nylon block and do not protrude.
- The lower wires are not kinked or caught around the control frame.

Symmetry

Pull the VG-on (full) and stand behind the glider holding the keel up. Control the glider's symmetry; check that the twist on both wings is identical. The twist must increase outwards, on both sides.

Equipment check

Harness

- Leg-straps are in place and buckles secured.
- Zipper unobstructed and running freely.
- Clip in and do a hang check. On the ground, the center of the speed-bar is deformed about 5cm (~2 inches) upwards, compared to its position in flight. Allow for this when evaluating your height from the bar; on the ground you should leave a gap of, at least, 5 cm in order to have a distance of 10 cm while you're flying. This position is generally the most comfortable.

When doing the harness check, if you have a curved speed bar you must consider that while you are loading the glider with your weight, the speed bar bends, thereby straightening the curve, (the maximum displacement could be roughly 5 cm. (~ 2 inches). If you therefore do a harness check of this type, allow the hang strap to be about 5 cm (~2 inches) long: this way you will hang the appropriate 5 ~ 8 cm (2~3 inches) above the bar in flight.

Rescue Parachute

- Parachute is in place and handle secured.

Helmet

- Strap is secured

Pre-Flight Check

- Hooked in.
- Strength and direction of the wind are safe.
- Nose angle is correct
- Wings are leveled.
- Take-off area and glider are clear.

VII. Disassembly on A-frame

The disassembly of the hang glider is carried out in the opposite way as the assembly; therefore you need to take the following steps:

Disassembly on the A-frame

Start Point

- Position the hang glider with the end part of the keel to the wind
- Make sure that the VG is completely loose

***Note**: make sure that the sail is loose before taking out the battens, the tips, the sprog and the Fiberglas tip.*

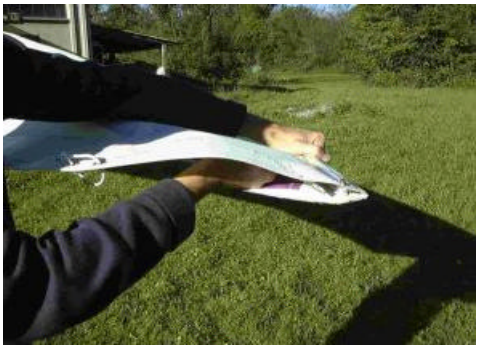
- If there is not much wind you can take out the final part of the keel pushing the spring button and pulling the end part of the keel; this part remains attached to an elastic cord
- Rotate the free part of the keel downwards and lean the main part on its back part (as in the picture)

- Open the zipper of the sprog and the tips.
- Remove the lower battens and then the upper battens starting form the end on the wing going towards the middle
- Slightly loosen the crossbar removing the nose plate and fixing it to the tension handle.
- Extract the rear-most section of keel by depressing the spring button and pulling the rear of the section; this section remains attached with a bungee.
- Swing down the free section of the keel, allowing the main part to rest on top of it. This way you can remove the battens easily.
- Get hold of the tip at the end part, which is free, and rotate them towards the centre of the wing till bringing them in the parallel direction of the leading edge (the tip remains on the outside part of the double surface).

***Note**: In the pictures here below you will see the battens still inserted into the sail. The operation has to be made when the battens have all been removed*

***Note**: it is suggested to assemble as described in the procedure, seen that it is possible to forget to hook in the cross bar before taking off.*

- Open the zipper at the end part and take out the transversal carbon batten
- Remove the battens starting from the extreme part of the wing towards the central part of the wing.
- Unzip the wing-tip zipper, grasp the tip-lever by the cord and pull it towards the outside.
- Unhook the tip lever with the cord and pull it towards the outer side
- While holding the lever with one hand, and the tip-wand with the other, pull the tip-lever backwards, taking out the cap from the Fiberglass tip.



- Remove the Fiberglas tip and put it together with the other straight battens.
- Rotate again the tip-lever in the inside of the sail and close the zipper. Place the tip-wand with the battens.

Folding the sail wing tips

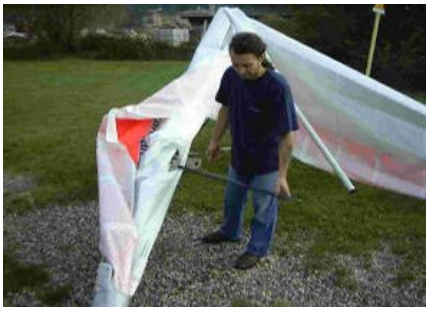
- With one tip-bag in your pocket, stand in front of the leading edge.
- Take the end part of the wing by the bolt of the tip lever and roll the sail up around the end part of the leading edge tube by putting it along the leading edge. The part you have in your hand needs to be turned towards the nose; the end part of the wing will be between you and the leading edge. Take the tip of the sail in one hand, and pull it back along the underneath of the leading edge.

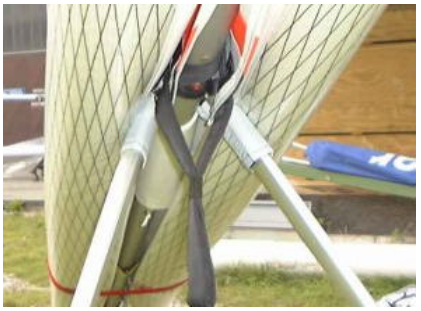
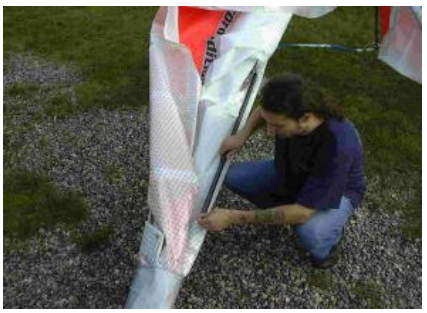
- Keeping the end part of the wing in this position, take the sail by the trailing edge and lift it upwards until it is tight and from this position roll up the sail starting from the trailing edge.

- Roll up the entire final part of the wing with the extreme part that you kept between you and the leading edge.
- Holding the rolled sail, slip the tip-bag over the tip.
- Repeat the same steps for the other side of the wing.

Final Operations

- Hook again the back part of the keel.
- Put the battens and the Fiberglas tip into their bag.
- Remove the nose fairing
- Unhook the nose wires. To do this you slightly need to force the nose of the hang glider towards the ground.
- Pull the nose ribbon so that you can remove the shackle to which the front wires are attached to. And open the safety system of the nose hook.
- Release the crossbar tension by depressing the spring button that holds the crossbar tensioning plate, and let it slide back into the sail.
- Swing in the wingtips, keeping them close to the ground. Pull the loose sailcloth to the outside of the wings as you close them.
- Remove the sprog from its adapter raising the extreme part of the tip, which is free. Take it off from its adapter and place it parallel to the leading edge.



- Fix the extreme part of the sprog, which is free, with the elastic of the extreme part of the tip.
- Fix the protection of the sprog junction with its Velcro.
- Then bring the wings near to the keel, keeping them close to the ground. Pull the loose sail to the external side of the wing and keel while closing it.
- Make sure that the T junction of the hang strap is rotated parallel to the keel.
- Roll up the sail and set the Velcro's. Make sure that the leading edge sail, where it joins the down tubes, is curved on the internal side upwards in order to avoid damaging the sail.
- After having checked that the nose fairing is attached to the string of the nose batten, you need to insert it into the space between the sail of the leading edge and the internal Mylar.
- Cover the hang glider with the bag.
- Rotate the hang glider and lay it with care on the ground.
- Unhook the speed bar, hook-in the nose shackle in one of the down tube adapters and place the protection on the extreme parts of the down tubes. This protects the sail from an eventual damage.
- While lowering the down tubes, make sure that the wires pass through the 2 down tubes and are not wrapped up. Also check that the hang strap is not wrapped up under the down tubes.
- Place the battens and the speedbar in the back part of the glider bag. To do this, you temporarily need to release one or more Velcro's Put the battens and the speed bar in the back part of the glider bag.
- Close the zipper and load it on the car; drive carefully

Flat disassembly

Start point

- Position the hang glider with the nose in the wind.
- Remove the nose fairing and unhook the nose hook.
- Put the hang glider down on the ground pulling it towards you.
- Release the tension of the crossbar by releasing the spring button that keeps the tension plate of the crossbar, and let is slip into the sail.

Note: make sure that the sail is loose. Now proceed in the same order as indicated for the "disassembly on A-frame" therefore go back to page 10.

VIII. Hints and Tips

Variable Geometry

The Laminar is fitted with a very efficient variable geometry (VG), which is located on the bottom of the control bar.
Pulling the VG cord out, moves the crossbar backwards, thereby it increases the nose angle and tightens the sail. Pulling the variable geometry in, improves the sink rate and the efficiency.

Variable geometry

ON	completely pulled IN
OFF	completely let OUT

Take Off

You can pull the VG somewhat on about 50cm (~20 inches) for take off so that the lower wires are not too loose. This will make ground handling easier. Basically: with the VG-off, the twist is quite big, which means the glider has a good takeoff behavior (hard to stall). Only when there are strong thermals at the takeoff area, is it preferable to let the variable geometry completely off.

Although the launch characteristics of the Laminar are for giving enough so that you can get away with minor errors when taking off, such as nose angle a little too high or takeoff speed a little slow, always keep the nose down and run hard. If your glider has gotten wet while setting up, towel it dry before taking off. A wet sail will stall at higher speeds, making take off and landing substantially more difficult.
IMPORTANT: Do not take off with a wet sail!!!

Flight

The Laminar full optional is one of the few hang gliders at high performances that is also easy to fly. Thanks to the efficiency of the VG system, every pilot can adapt it to his necessity.
The Laminar is sensible and pleasant to fly at every speed.
Here follow some **suggestions**, hoping that these can help you to face your flights in a more amusing and safe way. We believe that the following suggestions need to be kept in mind especially if your hang glider is a more performing version.
First of all you need to know that this wing is only made for very skilled pilots, who are familiar with the different weather conditions and who can preview what can be the dangerous situations that can be found during the flight.
Having said this, it needs to be considered that the more performance you require to a machine, the more attention needs to be paid to the flight speed. Thanks to its versatility, the Laminar ZERO-7 full optional, allows you to face in all safety the most desperate conditions, on condition that you always follow these simple rules:

- In regular thermals, it is possible to fly with a minimum VG on. This guarantees a better raising rate.
- Generally, though, use the VG in proportion to the speed you are flying at: the faster you want to fly, the more tension you can give to your sail.

ATTENTION: On the ZERO-7 full optional versions with VG completely on, the light twist offers an excellent glide performance, but in this case you absolutely need to respect the VNE of 100km/h in calm air, in turbulent air the VNE is of 80km/h. In the last years the performance of the hang gliders has increased that much that also a hang glider pilot needs to have a certain training of aeronautic mentality.

Do not leave anything at random, this can be very dangerous. Take your time to always follow the instructions and checks carefully.

Respect the simple rules described in this Users' Manual.

- The efficiency of the VG of this hang glider is counterproductive if you fly at excessive low speed with the VG completely on, due to the reduction of the handling.
- With VG completely on and at low speed you can find yourself quicker in a stall position than if you fly with VG off, demanding the pilot a major presence of mind and a major quote in order to get in a normal flight position.
- With low speed, the hang glider gets quicker in a stall position with VG completely on than with VG off, demanding a major presence of mind from the pilot and also a higher altitude in order to get in a normal flight position.

ATTENTION: Always avoid flying near the ground with the VG completely on, no matter which hang glider you are flying with. Especially on the ZERO-7 full optional with VG on, you can find yourself quicker in a stall position. This is due to the introduction of the new and more performing profile with a reduced radius on the leading edge. If you loosen the VG progressively, the radius on the leading edge will increase in proportion, guaranteeing an expected and safe behaviour to the stall position.

- Use the VG in relation to the metrological conditions you are flying in: in turbulent conditions the tension of your sail should not be such to excessively reduce the performance of the wing and neither should it reduce the handling

Landing

The stall behavior is optimal with less twist (more VG). With a little VG-on (approx. ?) you have a good compromise between good roll reaction time and good stall behavior.

- Approach the landing field with a medium speed.
- When you are near the ground slow down, and then keep flying parallel to the ground, gradually easing up the speedbar.
- Keep a light touch on the down tubes, holding them as high as possible for maximum flare authority.
- At the right moment, flare and land on your feet.

IX. Trim

Speed

With the VG slightly on (20-30 cm/7.9-11.8 inches) the speed should be just above minimum speed, with your hands in a neutral position on the speedbar (approx. 4-5 km/h / 2.5-3.1 M.P.H. above stall speed). When you move your hang loop position forwards, the glider will be trimmed faster and moving it backwards results on a slower trim.

Attention: with a glider trimmed too slowly it will have poor roll maneuverability as well as poor turn behavior in slow thermal flying (glider tends to fall into the turn).

Turns:

First of all you must know if your glider has a turn with the VG-on or VG-off.

Turn with the VG–off: It is possible to correct it by adjusting the fiberglass tip. For instance, if the glider has a right turn it means that either the left fiberglass tip must be raised or the right one lowered. This is achieved by rotating the leading edge tube end cap (with the eccentric hole). You have to remove the nut, which secures the sail and, at the same time, gives the deflection and secures the fiberglass tip. Unscrew the small safety screw on the end cap. Remove the aluminum tube, and then take the end cap out using a screwdriver. By turning this eccentric cap you will adjust the fiberglass tip's height. The hole upwards means a higher position.
You may test fly the glider without the small safety screw due to the high adhesion of the end cap. Once you have found the proper position, you should drill a small hole in order to secure the end cap with the screw again. You must replace the safety screw.
Another possibility is to modify the batten profile on the outer wing of the turning side (increase the curve on the last 3 battens – nr. 9, 10, 11– approx. 1cm/0.39").

Turn with the VG–on: When the Laminar has a turn with the VG-on, you must check the symmetry. The swivel tips work even in slow flight, if they are not equally positioned the glider will not fly straight. For instance, if your glider turns to the right, the right swivel tip is too high or the left one too low. If the bar pressure is strong at high speeds, full VG-on (80 km/h / 50 M.P.H and up), in a glider with a right turn, the right swivel tip should be lowered a little. If, on the contrary, the glider has little bar pressure, the left swivel tip should be raised slightly. By turning the adjustment screw clockwise, you will have a lower swivel tip position and counter-clockwise a higher one. The swivel tips are secured with security-pin and the certification is valid for the settings you get from our factory only. Beware that as soon as these settings are modified, the certification will no longer be valid!
Only in exceptional cases, for instance a glider with a turn and with strong bar pressure at high speeds in VG-on configuration, can you lower your swivel tips!

Winch and UL– Towing

The ZERO-7 is suitable for winch and/or UL- towing. You can winch tow with VG-on a little (? - ½); pulling the VG enables you to optimize your climb rate and therefore have a better release height. To tow with a UL it is recommended to set your VG according to the towing speed. With a slow UL (Dragonfly, big trike area) you can tow with less VG-on. With faster towing trikes it is better to use more VG (½- ? of the VG-path).

X. Adjustments Values

Swivel tip height:

You can control your swivel tip setting by running a cord from a batten on one side to the same batten on the other side and measure the distance from the bottom side of the keel (see minus sign) to the cord. For proper measurement pull the VG fully on (side wires should be tight). To only control the swivel tip setting it is enough to measure battens # 8 and # 10.
***ATTENTION*: Settings valid only with indicated wire lengths.**

Laminar ZERO-7 14.8 (DHV):

Version	Crossbar stop cable	Batten #8	Batten #10
Bainbridge	770mm	-50mm	-80mm
Dacron	740mm	-15mm	-40mm

Laminar ZERO-7 14.2 (DHV):

Version	Crossbar stop cable	Batten #8	Batten #10
Bainbridge	725mm	-50mm	-60mm
Dacron	705mm	-30mm	-40mm

Laminar ZERO-7 13.7 (DHV):

Version	Crossbar stop cable	Batten #8	Batten #10
Bainbridge	770mm	-50mm	-50mm
Dacron	715mm	-35mm	-40mm

XI. Recommendations

Motorization

Extensive testing and certification procedures are necessary for hang glider motorization with the different systems. You must contact a specialized dealer.

XII. Short packing

To short pack your glider (4.15m~13'7") it is important to follow these instructions:
1. Undo the sail fastening on the end of the leading edge tube.
2. Remove the compensator cable attached to the swivel tip lever.
3. Press the spring button on the rear leading edge and remove it. On the 14.8 ZERO-7 it is 120cm~3'11" from the tube's end and on the 13.7 ZERO-7 it is 95cm~3'1".
4. Make sure not to wrinkle the Mylar leading edge insert too much when you fold the sail; you may also take it out.

Repeat steps 1-4 on the other wing.

XIII. Repair and Periodic Inspection

Every year, or after 100 flight hours (MANDATORY):

- Replace all the bottom wires.
- Compare the curve of your battens with the supplied batten plan.
- Check the reflex and dihedral as described in the next chapter.

Every 2 years:

- Have a check done by an authorized dealer or by our workshop
- Remove the sail and carefully check the frame for bends, dents, corrosion or other damages.
- Check that all bolts are tight and not damaged.

Every 5 years or after 500 flight hours (MANDATORY):

- Replace the sail and all the parts which eventually are damaged and worn.

This check, done by qualified personnel, is obligatory in Germany

After a crash or heavy landing

- Carefully check your whole glider.
- Check particularly the part of the glider that has been hit in the crash.
- Replace the damaged parts with original parts only. If you have any doubt about the damaged parts call an ICARO 2000 dealer, or our workshop. We will be pleased to give you some advice.
- When dismounting your glider, take care to notice exactly how each component is connected. Never rush a repair job. By taking your time, you're far less likely to make a mistake in re-assembly. Furthermore, treated with care, your glider will last much longer.

General Advice:

- The wires must be periodically checked for kinks or broken strands.
- Dirty parts must be cleaned with warm water.
- A wet glider must be dried before storing. Don't leave your glider wet for more than a day or so, because mildew and corrosion may result.
- When opening the glider be careful not to dirty the sail.
- Salt water causes oxidation on all metallic parts. If you land in the sea and survive, you must disassemble the entire glider, and wash all tubes, bolts, wires, and the sail very thoroughly with fresh water. This will prevent rusting.
- If you fly regularly at the coast in windy conditions, be aware that sea spray can have the same effect. Hose down your glider after such flights, and keep a special lookout for corrosion.
- Disassemble your hang glider after a certain number of flight and make a special check for the corrosion.

XIV. Technical Data

	U.M.	ZERO-7 L13.7	ZERO-7 L14.2	ZERO-7 L14.8
AREA	m^2	13,77	14.24	14,88
	ft^2	147.9	153.28	160.17
NOSE ANGLE	Deg.	130	128	130
WINGSPREAD	m	10,6	10.33	10,48
	ft	33'00"	33'89"	34'38"
ASPECT RATIO		7,35	7.49	7,38
DOUBLE SURFACE	%	94	94	94
BATTENS (UPPER+LOWER SAIL)	#	24+6	24+6	24+6
WEIGHT – WITHOUT GLIDER BAG	kg	32	33	34
	lbs	71	73	75
PILOT HOOK-IN WEIGHT	kg	60/90	70/100	75/110
	lbs	132/198	154/220	165/243
PACKING BAG LENGTH	m	4.98	5.10	5,20
	ft	16'4"	16'8"	17'1"
SHORT PACKED LENGTH	m	4,15	4,15	4,15
	ft	13'7"	13'7	13'7"
CERTIFICATION		DHV	DHV	DHV

Note that the technical data of the ZERO-7 13.3 are not available yet; the certification is in progress.

XV. Maintenance Log

Enter here the details of any modifications or repairs made to your glider.

Date	Modifications or Repair

Note:

XVI. Owner's Log

This log provides a history of the glider's ownership. Please make sure details are correct when you sell the glider.

Purchase Date	Name	Telephone	Address

Notes: