

# MINIPLANE paramotor

## user's manual

maintenance, directions and suggestions for the proper use

last update : 10 august 2022



unauthorized copy, even in part, of this manual is forbidden.

Should you have any doubt do always refer to our closest technical servicing or directly to :

The logo for PER IL VOLO. It features the words "PER IL VOLO" in a stylized, outlined font. To the right of the text is a graphic of a hand holding a propeller.	<p>PER IL VOLO S.N.C. via ca' Onorai 50 Italy - 35015 Galliera Veneta PD</p>	<p>Contact : posta@miniplane.com</p>
<p>YOUR DEALER</p>	<p>Miniplane UK <a href="http://WWW.Miniplane.co.uk">WWW.Miniplane.co.uk</a> Russ@miniplane.co.uk</p>	
<p>web pages :</p>	<p>WWW.Miniplane.co.UK      www.miniplane.net</p>	
<p>Web Shop :</p>	<p><a href="http://WWW.miniplane.co.uk/">WWW.miniplane.co.uk/</a>      Miniplane LR shop</p>	

Perilvolo



Miniplane



Miniplane Paramotors

Miniplane & TOP80 owners

The MINIPLANE is a paramotor, it is made for sport activities, it must be used following local regulations, it is NOT made for professional activity, it is NOT built for stunts, acrobatics or unusual maneuvers.

This is a user manual, it is not a professional maintenance manual, you will not find here any indications for adjusting the ignition angle, compression, bearing sizes or similar.

For this type of intervention, we advise you to contact authorized professionals.

This manual will be updated periodically, we will try to make it known to all customers, stay in touch on our web pages.

At the end of each topic there are some **recommendations** and **safety advise.** as the following:

The Paramotor flight is regulated in most states and is reserved for specially trained people. At the time of writing, there is no authority that can guarantee compliance with the regulations of all countries.

**It is your duty** to inform you **and arrange to obtain** if permits, registrations, insurance or licenses are needed in your country.

The use can cause accidents with serious and fatal consequences for both practitioners and third parties.

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## **WELCOME to the MINIPLANE owners family**

The purpose of this manual is because we want you to use our Miniplane in the best possible way to have fun in safety.

In this manual we list some safety warnings, it is dictated by our experience in knowing the most common problems, especially for beginners, but the list is certainly not complete.

The manual is a useful complement, not an exclusive to your preparation.

We count on the cooperation with your instructor and your experience to continuously improve your safe enjoyment.

to do this it is essential to know the exclusive construction features of the MINIPLANE, we believe that your instructor's work can also benefit from reading this manual.

This manual is a guide and will need continuous and frequent updates, which we will certainly do constantly, but we already apologize if you find outdated information or unclear explanations.

We will be grateful if you report any small problem that makes the manual incomplete, inaccurate or difficult to understand.

## PARAGLIDER

In order to fly the MINIPLANE needs a good companion

### Which paraglider to choose

We recommend that you use paragliders special made to use with paramotors.

The specialized wings offer very different performances, safety level and characteristics according to the level of preparation of the pilot to which they are dedicated.

In some countries it is mandatory that the glider, the paramotor or both has a technical certification.  
Your instructor or your dealer will be able to advise you on the most suitable product.

Volare Volo snc - MINIPLANE - TOP80

## Adjusting the brake line length

The MINIPLANE is built with two paragliding attachment solutions:

- the PSF system, with the coupling carabiners high, just above the shoulders, normally called “high hang point”
- In the ABM system it is approximately 20 cm (6 ") lower than PSF, normally called “swing arms”

The length of the control lines connected to the handle should be adjusted accordingly to allow for a comfortable position and effective operation, with no unnecessary travel and no brakes partially applied when the handle is released.

This adjustment is very important and must be carried out following the instructions of the glider manufacturer **before** the first flight.



Some manufacturers offer the possibility to move the guide pulley (and the handle rest point) of the control line up and down on the risers in two or more positions.

### ATTENTION

to lengthen the command DO NOT add handles in series with the original ones. During maneuvers you would not have control over their position, and they can easily be captured by the propeller.

### ATTENTION

DO NOT lengthen the control cable by adding a knotted extension, the knot may get caught on the driving pulley.

## UNBOXING

The MINIPLANE paramotor is assembled in the factory and tested to verify that all its components are functioning.

The motor is tested for the time necessary to verify its operation with standard parameters.

To allow transport, the Miniplane is then disassembled,

it must be reassembled before it can be used.

The different models and the relative variables have a different assembly procedure, below we will give general indications to allow you to carry out the assembly without errors.

Assembly must be carried out by competent persons or under the assistance of authorized persons who know the mechanical and constructive characteristics of the MINIPLANE.

Before and during assembly it is necessary to check the integrity of the components that may have been damaged during transport.

Immediately report the smallest problem you encounter.

Before you start you will need a space large enough to assemble the unit and some tools:





Open the box and carefully remove and check the contents, you should have:

- Main chassis and engine
- Foot section (excluding classic version)
- cage /net (rigid or flex version)
- Exhaust system
- Propeller and covers
- Cooling shroud – it may already be fitted
- Bag of connections/oil/etc
- Harness
- Airbox

Perpaso II Volo snc – MINIPLANE – TOP80

## ASSEMBLING

### A) FRAME and ENGINE

the first part of the assembly involves the central part of the frame and the engine.

During this operation it may be necessary to secure the MINIPLANE to prevent it from falling.

- some MINIPLANE versions with **flex cage** have a separated feet and may need to screw the conical sticks from the frame to the feet.
- Mounting the low parts of the 4 section **rigid cages** help to stabilize the frame on the ground

Carefully place the main chassis/engine on a flat surface – the transport box lid is good for this,

MINIPLANE with separate feet :  
remove the spring clips in either side of the connection tubes at the base:



Slide the foot section onto the connection tubes of the main chassis until the holes align and insert the frame clips fully:

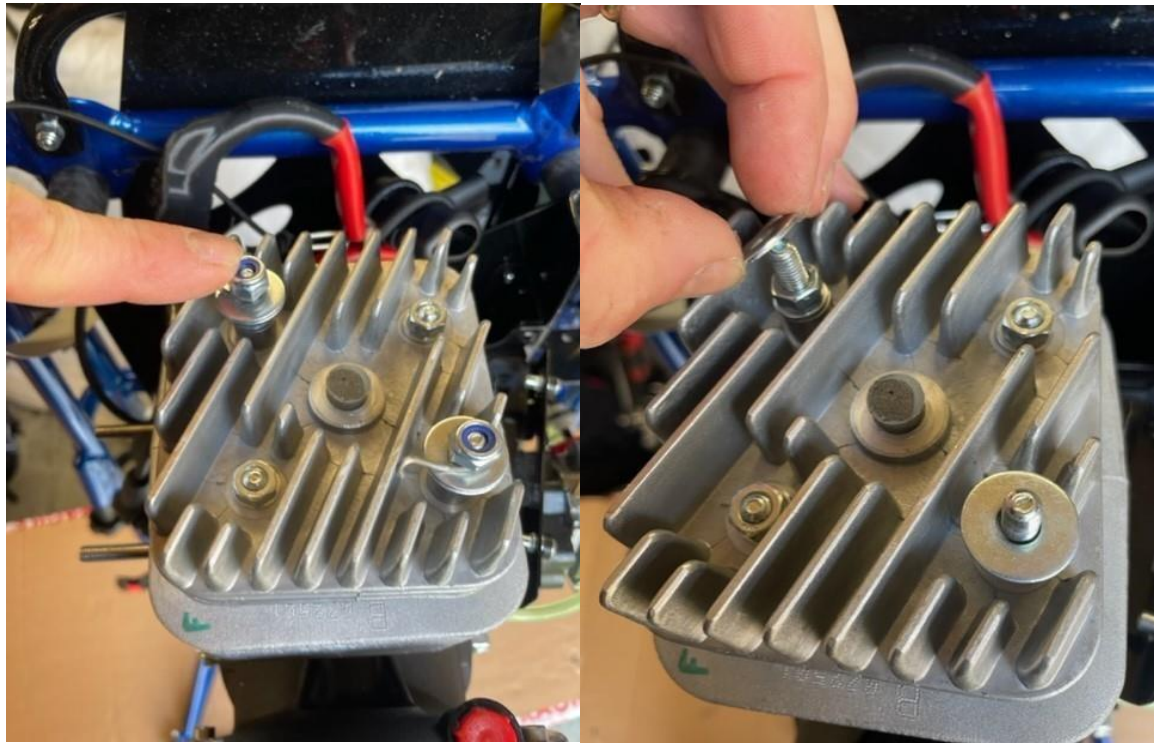
**Put the frame upright**, Install the engine components: muffler, airbox, cooling hood, gearbox, etc. using the supplied screws which are the correct length.

Follow the tightening torques indicated in the table (end of this document), you will need to use one (or more) suitable torque wrenches.

Pay particular attention to the screws of the elastic supports (engine and exhaust), which have a blind internal thread; using unsuitable screws, if they are too short, will not fix the component, if they are too long they destroy the elastic part.

Standing the unit up, be careful, until it is fully assembled it can easily fall over.

Remove the 2 10mm nuts from the longer cylinder head studs, remove the wire clip and 1 large washer, leave a single large washer on each of the longer studs:



snc - MINIPLANE - TOP80

Remove the 2 small bolts and plastic washers that will be used to secure the cooling shroud:

Per Il Volo snc



Carefully fit the carbon cooling shroud over the cylinder head, you will need to start by placing it over the exhaust manifold studs and easing it over the cylinder and onto the 2 locating holes,



place a large washer, the spring clip hook and a 10mm nut on each of the protruding cylinder head studs:



Remove the rubber travel cap, fit the spark plug and torque to the [required specs](#)

Fit the plug cap and secure with the rubber band.



Fit the 2 small bolts/washers to secure the cooling shroud, ensure a drop of thread-lock compound is used on these bolts:

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Secure the Spark plug lead with the clip and screw:



Place the copper exhaust gasket over the studs, fit the exhaust system in place using the supplied button head Allen bolts (if not in place) and exhaust springs/nuts set, use thread lock to secure the bolts. Don't fully tighten the nuts on the cylinder head studs, only tighten until the springs are approx. halfway compressed, you should be able to fit a 0.5mm feeler gauge in between the coils of the spring:

The nuts are high temperature self locking, don't need any locking glue there.



After having checked that the central part of the muffler is correctly oriented (exactly vertically under the elastic support), tighten the screws on the silent block passing through the hole in the gusset plate. DO NOT use screws longer than the original supplied ones.

These screws tightened according to the table need neither thread locker nor washers. When tightening the screw make sure that the silent block does not rotate.



Fit the airbox over the air filter, make sure it houses correctly in the groove.

Use the screw and nut to secure through the lower hole on the wing to the frame.

The air box **SHOULD NOT BE FIXED RIGIDLY** to the frame, you have to leave it free to move to absorb the vibrations of the engine, if you want to add a safety cable (many do it as a precaution, but we do not consider it necessary), leave it slack.

Remove the travel cap from the gearbox and fill with **HALF** of the supplied oil.

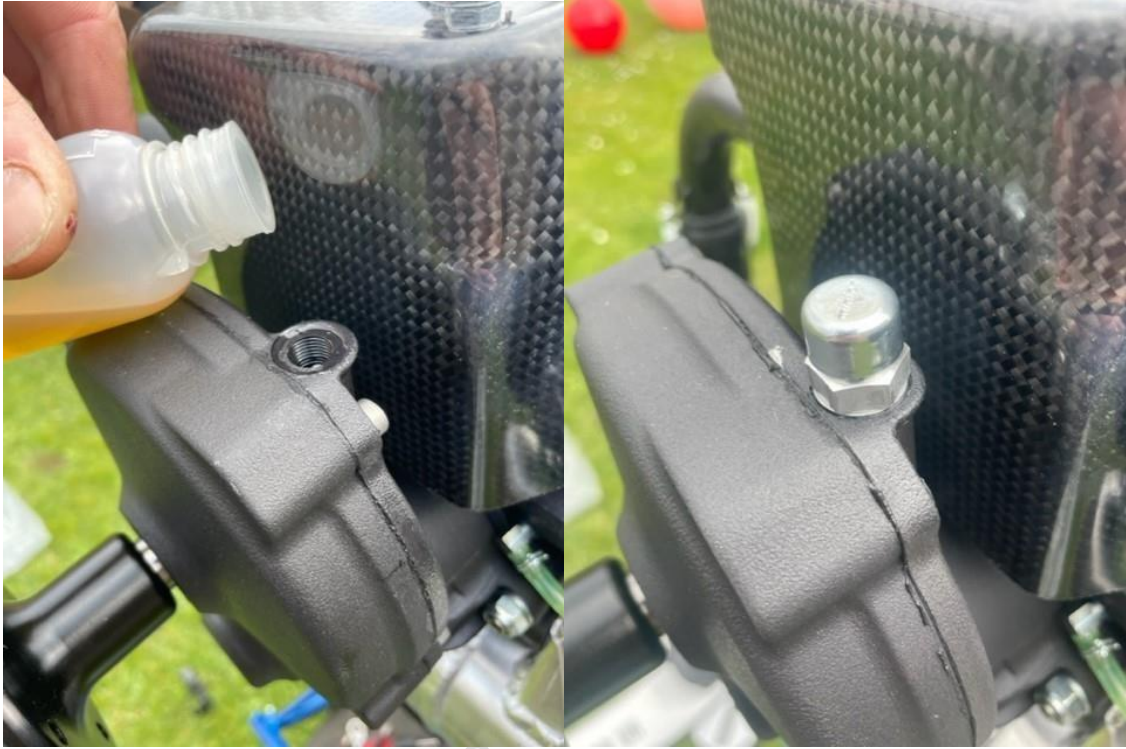
Unfortunately for safety reason we can't send it in all country, sorry.

In this case, get the right lubricant, the required quantity is 50 cc of 80-140 grade oil, which corresponds to about 30 grams; this lubricant is commonly used in car transmission systems, it is probably easy for your mechanic to give it to you for free instead of buying too much in a shop.

A funnel, or a syringe, or by running the oil along a screwdriver using the Coanda effect, can make this operation easier.

Then fit the breather cap at correct torque





## SOME SPECIAL INSTRUCTIONS for the LR model

Version with Dell'Orto basin carburetor.

The airbox is further away from the engine than the other versions.

To avoid overloading and damages of the elastic carburetor support, the weight of the air box must be supported by the frame, both during operation and transport.

The fork support visible at the bottom is a clip (as on the opposite side) which in addition has a velcro to keep it in place.

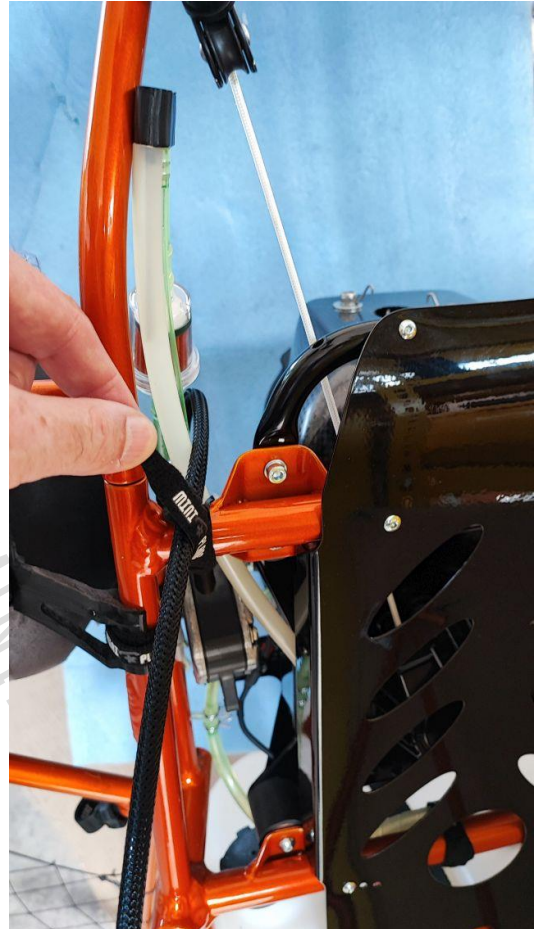
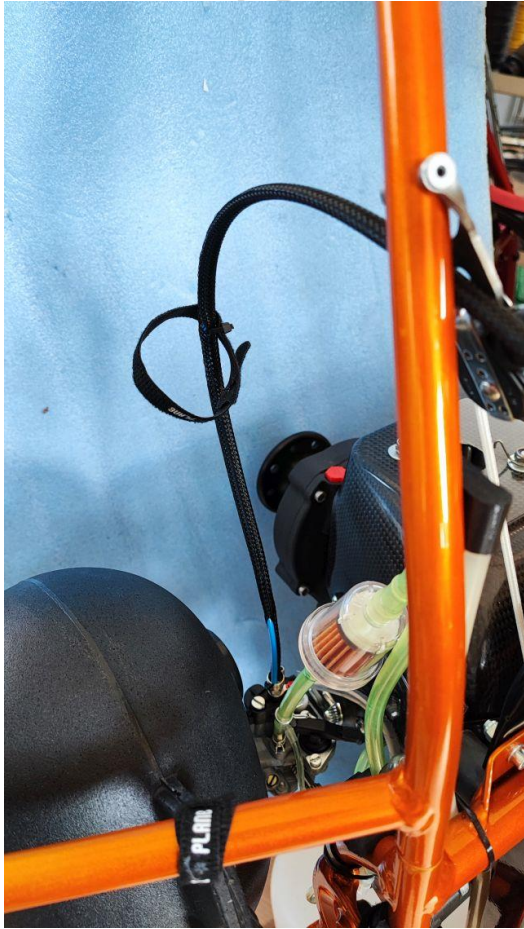
The pin of the clip holds the upper part of the cage in place (as explained below), therefore it must be removed to disassemble the cage.



During operation the airbox must also be supported

We recommend that you reinsert it for transport so as not to overload the carburetor support, if for some reason it was not possible, we advise you to remove the air box from the carburetor by unscrewing the collar.

with the velcro visible at the top, to guarantee a certain degree of freedom it must not be pulled completely, you must leave about 2 cm before it touches the frame, the correct tension can be verified from behind (propeller side), the axis of the carburetor it must be horizontal.



The throttle control cable must be fixed to the frame with the special velcro as shown in the photo

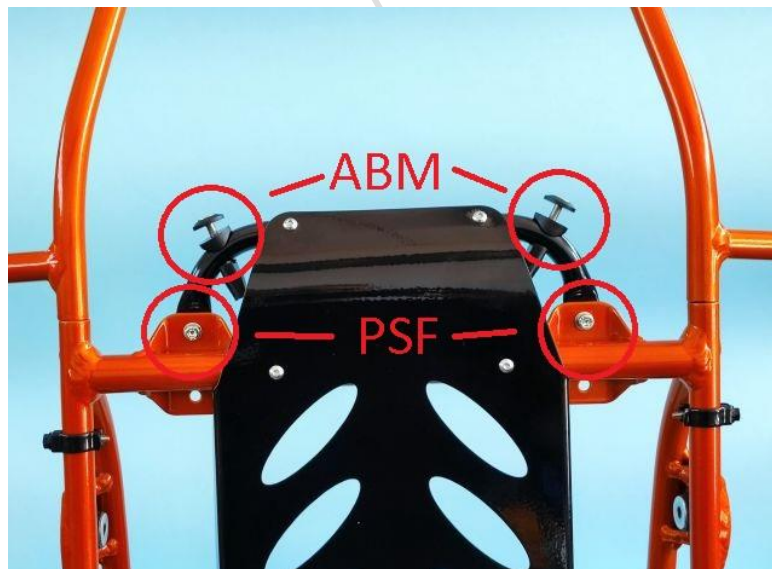
## B) ARMS & HARNESS

The second step concerns the assembly of the harness and arms.

The weight of the mounted harness will restore balance to the MINIPLANE on the ground, making subsequent operations easier.



Make sure the straps are secured:



The **buckles** used in MINIPLANE harnesses, for safety reasons and to avoid accidental opening, are constructed so that they can be opened with a mechanism that is activated exclusively with a simultaneous pressure in two points in contrasting direction; for the same reason they are also more difficult to open when under load.

## TRIM



The MINIPLANE is adjusted by moving forward or backward the **attachment point** of the wing in order to obtain a **positive incidence of about 5-10 degrees** (the thrust vector slightly upwards) and asymmetrical to compensate for the torque.

The frame, arms and harnesses are designed to compensate for the torque generated by the engine and applied to the propeller. **Both the PSF and ABM arms systems are asymmetrical.**

For the TOP80 engine with clockwise prop rotation, seen from the pilot's position, the attachment point of the wing is further forward on the left and further back on the right side, you can change these measurements to get the right incidence, but keeping the left / right difference.

The difference between the right / left measurement must be adjusted as needed and can vary according to the weight of the pilot, the flying style and the type of wing used. We suggest you start with 1-2 cm and then you will find the best size for you.

Also the **side distance** from the thrust axis of the propeller is greater on the left and smaller on the right, **you cannot modify** this measurement which is preset by the frame geometry.

In the following chapters we will give you some basic setup measures for each ABM or PSF solution.

A first adjustment is made on the ground on a ground simulator ( schools are provided with it), then a check must be made in the first flights.

A badly adjusted paramotor or by incompetent people can be very dangerous and cause unsolvable stability problems in flight.

## PSF System

High hang point.

PSF is the solution invented by MINIPLANE since the beginning of its history.

After so many years (almost 30 at the time of writing) the solution is still appreciated by many pilots and by many schools for its stability, ease of use, easy adjustment and the good feeling of safety transmitted to the pilot.

### PSF J bars

In the following photo from above you can see the frame with the PSF arms (black).

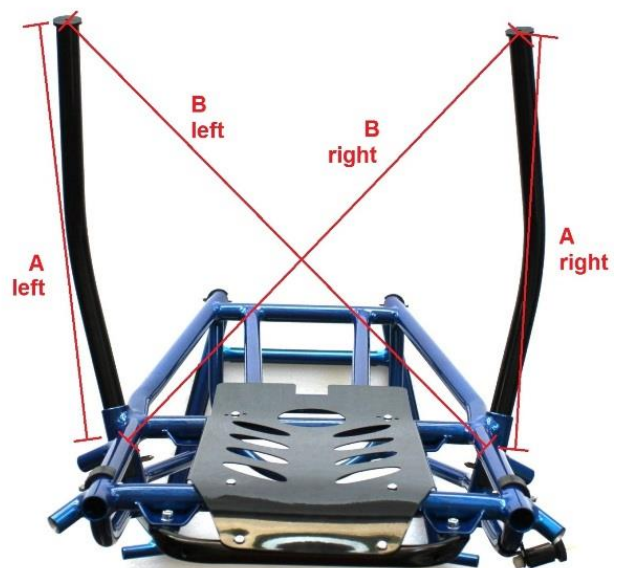
As mentioned it is not symmetrical.

The measurements A and B left are longer than the corresponding ones on the right.

The ends of the arms are attached to the harness, near the chest strap.



Consequently, the attachment points of the glider are asymmetrical.

These measures change with the different versions of the MINIPLANE frames, you will only need to know them if you need to replace the PSF brackets, therefore we refer you to the relevant descriptions on [shop.miniplane](http://shop.miniplane).



## PSF Harness mounting

The PSF harness upper belts must be fixed to the frame in the points shown in the following photos.

<p>After removing the screws in the highlighted points,</p>  <p>insert the harness strap between the frame gusset and the arc (blue and black in the photo).</p>	 <p>Reinsert the screw and tighten with the torque indicated in the table (M5 screws).</p>
<p>The harness is also fixed to the frame with back straps, which (depending on the model) must be taut but allow a sliding up and down to facilitate the transition from standing to sitting position.</p> <p>If you have trouble finding a comfortable standing position easily (the seat pushing too hard on your legs), you probably need to adjust this strap better or it has not been mounted in the correct place on the frame.</p>	
<p>the strap that comes down from the shoulder straps is fastened to the frame at the bottom.</p> <p>Some Miniplane version have the belt screwed to the frame, some other have a loop on the base tank ring.</p> <p>These belts are in contact with pilot's body, so mounting them they must remain inside the arms and the other back belts (the one parallel to the PSF Jbar).</p> <p>The adjustment is described below.</p>	

The PSF harness has 2 carabiners hang point on each available size M, L, XL, higher or lower according to your height.

Generally, if you have no particular needs, the carabiner goes to the highest point.



Volo snc - MINIPLANE - TOP80



## ***PSF setting***

- As a first basic calibration, consider that the distance from the **carabiner to the fastening point** of the shoulder straps on the frame for an 80 kg pilot is 31 cm on the left and 1 -2 cm less on the right, a little longer measure for heavier pilots, a little less for light one.

A more accurate calibration with the pilot sitting on the MINIPLANE hooked to a swing stand frame is mandatory before the first flight, the adjustment must be made to obtain the correct incidence of the thrust axis in flight.

- After you have properly adjusted the trim angle, you can adjust the tension of the **shoulder straps**.

The function of these straps is to support the weight of the engine when the pilot is standing.

The adjustment must be made standing with the paramotor on your shoulders with the fully assembled and wearing the clothing you will use in flight.

Attach all the buckles, leg straps, chest strap and the one that connects the shoulder straps.

The right tension is achieved when the weight of the MINIPLANE is almost exclusively supported by these shoulder straps.

In fact, you will find that if you leave it too long, the weight of the engine is transmitted to the seat, giving an annoying sensation of weight increase, hindering the movements of the pilot and the transition to the sitting position.

- The **leg straps** must have the right tension to allow the movement of the legs to run and at the same time keeping the board in a position that allows you to sit easily without strange maneuvers and, preferably, without the help of the hands that are already engaged for control of the glider.

The geometry of the MINIPLANE has been extensively tested and allows you these maneuvers, you can simulate them on the ground until they are instinctively natural.

A take-off simulation with the magical simulator stand will help you in this setting.

When, while wearing the harness, you hook the buckles of the leg loops, remember that they must be under all the other straps, do not take the anti-torque straps or the speed system lanyard captive for example.

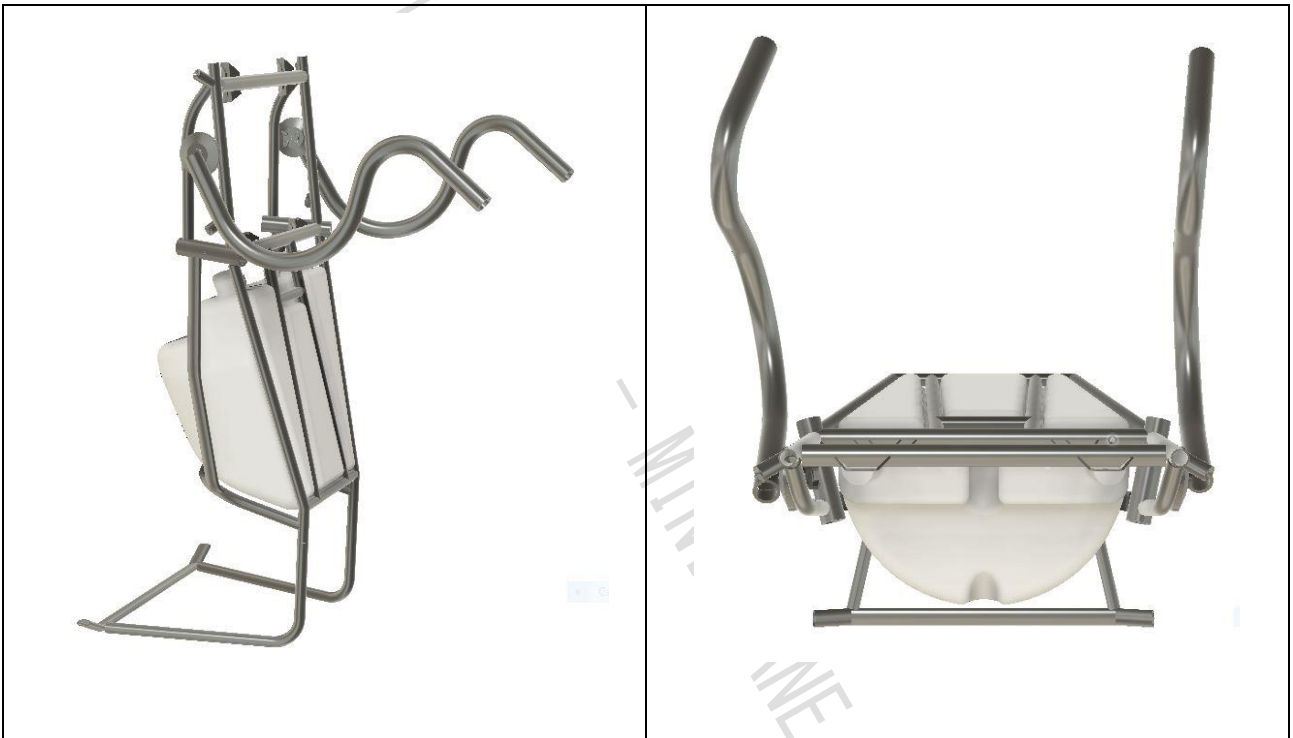
The **chest strap must be tightened** after having hooked the buckle (and vice versa, it must be released before unhooking it). The right tension counteracts the outward force transmitted by the sail and avoids overloading the J arms.

## ABM System

We designed the ABM system on year 2005 to satisfy pilots who demanded more and more handling from the paramotor, in order to "feel" and control the glider similar to free flight.

The solution we proposed was with tilting arms with a geometry that equally gave handling and intrinsic stability. We have achieved this with the S-shape arms and we have positioned the attachment point of the sail aligned with the thrust axis of the propeller, in order to have a neutral balance of the machine and a stability in the movement of the arms. For this reason the we called it "Attacco Basculante Medio" "medium swing hang point" as opposed to what were known as "low attacks".

Today this solution has become a standard for all manufacturers.



The swing arms are asymmetrical, the hooking of the glider is moved to the left, this is obtained with a different curvature of the right / left arms.

Don't be worried the first time you see them "crooked".

## **ABM Arms**

the flexible arms are connected to the frame with a screw that acts as a pivot for rotation.

the screws must be tightened enough to avoid play, but not too tight to avoid blocking the up/down movement. To facilitate this adjustment we have chosen to use a spring (classic version) **or** a rubber pad glued to the frame (2016 or LR version), which are compressed by the nut.

Only one of these solutions is required (do not mount the pad and the spring together).

- **Springs:** put in the internal part of the frame before the nut which must be mounted with suitable tools leaving a small space of 1-2 mm before the complete compression.

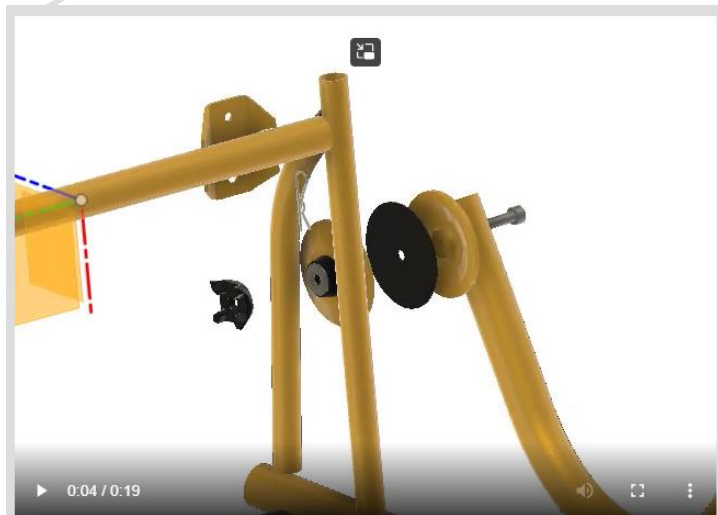
- **Rubber pads:** is glued to the frame with the same elastic function.

For the more "robust" chest pilots, we remind you that there is the possibility of mounting 1 or 2 cm spacers (per side), consequently the screw must be changed with one of adequate length.

In the video: the solution with rubber pads don't needs tools, fixing is done only with the wing nut tightened by hand.

After having tightened the nut to the desired force (free up-down movement and no side play on the arm), a safety pin is inserted, which prevents the nut from rotating.

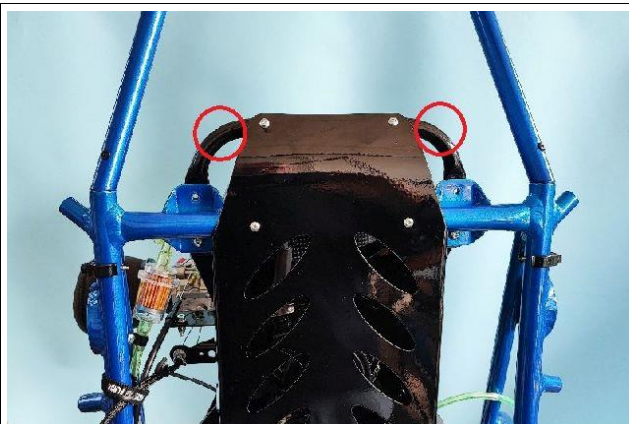
Then the pin is stopped by an elastic ring to prevent it from moving with vibrations, this elastic (not visible in the video) is only necessary if you plan to leave this system mounted for a long time.



## **ABM Harness**

The Miniplane ABM harness is mounted as shown in the following photos.

upper straps must be fixed to the frame using the provided screws ,



The seat angle and the backrest length can be adjusted, according to the pilot's needs, by fixing the backrest strap above or below the frame tube, and / or on different holes on some MINIPLANE harnesses.

Some harnesses also have the possibility of adjusting the backrest with a velcro.

Where to fix the harness with the belt and buckle  
( Dudek, Apco, etc.)



## **ABM setting**

The ABM harness is relatively easy to adjust, the difference in comfort between good and insufficient adjustment is enormous and affects the safety of use.

Some adjustments are pre-set at the factory, some other are personal and must be adapted to the pilot's needs, weight, size, physical proportions and even the flying style.

The vertical length of the **backrest** and its attachment point on the frame influence the **seat** height and inclination.

The **shoulder straps** have the purpose of supporting the engine, they must be gradually pulled up to the point where it is evident that the weight is not transmitted to the seat; excessive tension, however, keeps the frame too adherent to the pilot's back, especially in the last phase of the take-off run, leaving them a little looser in fact the MINIPLANE with ABM system magically tends to straighten itself even if the pilot is bent too much forward by mistake.

The balance, the torque compensation, of the MINIPLANE is also obtained with another asymmetry, the **attachment point of the glider** is further forward to the left than the one to the right.

As a basic setting of the left arm we recommend 32 cm from the center of rotation to the carabiner base, and 1-2 cm less on the right. These measurements are generally correct for a pilot of about 75-80 kg, a heavier pilot needs to increase this measure, a lighter one to reduce it.

The goal is always to reach a **positive incidence of 5-10 °** as mentioned at the beginning of this chapter.

To obtain the most correct trim, a ground coupling test and careful observation in flight by an expert third party will be necessary.

We advise you to tighten the **chest belt** until you reach a distance measurement of about 40 -42 cm between the bow shackles (the stainless steel ones that connect the harness to the ABM arms, not those of the sail), an excessive distance between them can cause system overloads, deformations and even breakage of the ABM arms system.

- The **leg straps** must have the right tension to allow the movement of the legs to run and at the same time keeping the board in a position that allows you to sit easily without strange maneuvers and, preferably, without the help of the hands that are already engaged for control of the glider.

The geometry of the MINIPLANE has been extensively tested and allows you these maneuvers, you can simulate them on the ground until they are instinctively natural.

A take-off simulation with the magical simulator stand will help you in this setting.

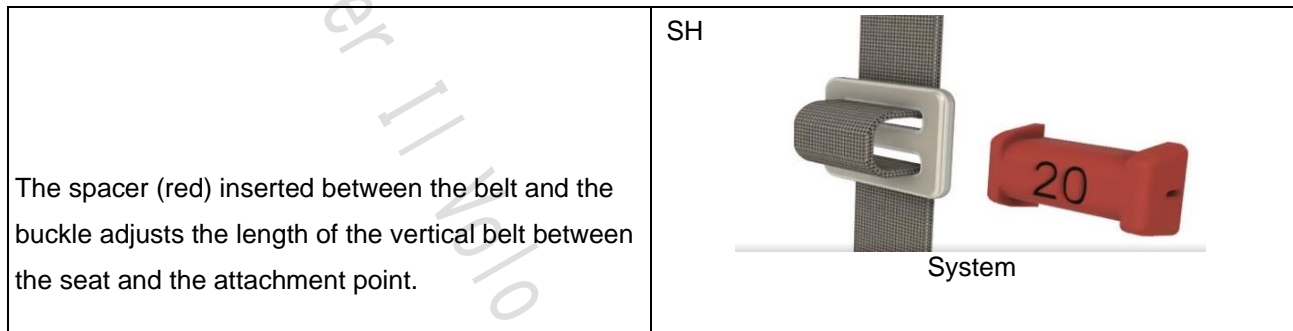
When, while wearing the harness, you hook the buckles of the leg loops, remember that they must be under all the other straps, do not take the anti-torque straps or the speed system lanyard captive for example.

## ABM light harness SH setting

The MINIPLANE ABM Light harness offers the possibility to adjust the length of the **backrest** with a velcro on the base, just below the padded edge of the seat.

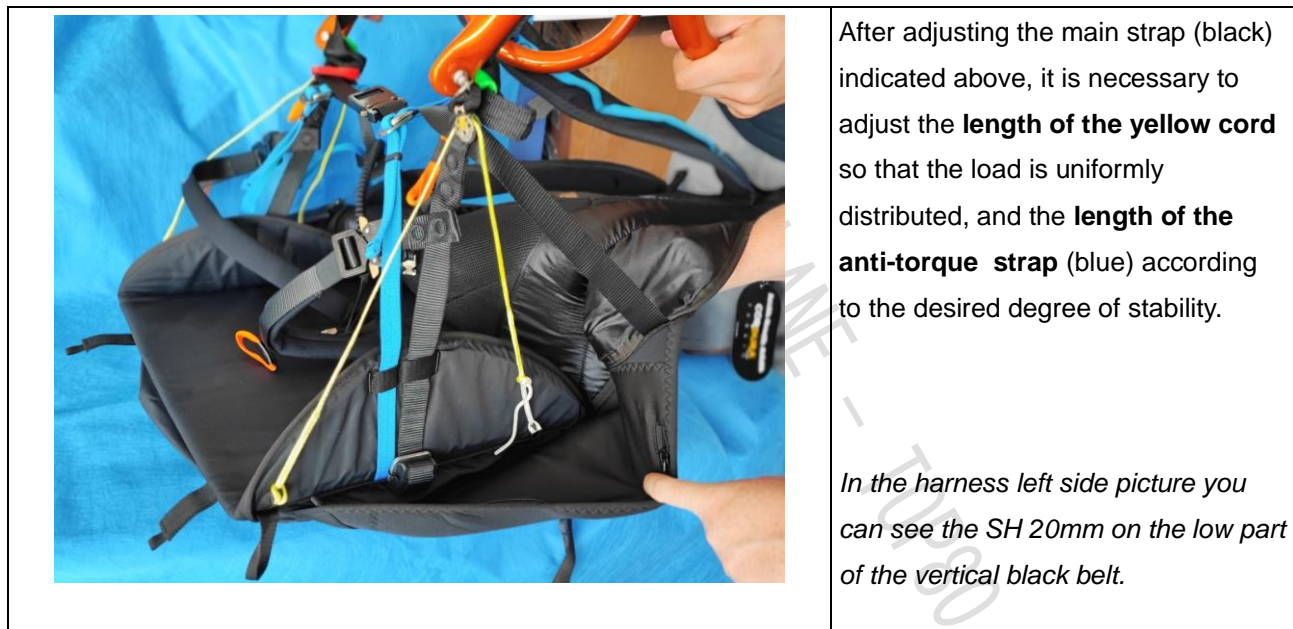
By overlapping the double lips with velcro straps, the length of about 6 cm (more than 2 ") can be changed, even partially.

The possibility of **adjusting the Seat Height (SH)** comparing the attachment point of the glider was introduced for the first time in the MINIPLANE ABM Light harness.



2 spacers of 20mm and 40 mm are supplied, on request we can provide other measures.

It **should be positioned as low as possible** to reduce the possibility of the yellow cord overlapping.



The **yellow cord setting** is simply done moving the position of the stop knot on the white cord.

After having found the right adjustment, we advise you to mark the white cord with a felt-tip pen, to speed up the pre-flight checks.

## C) CAGE

it is time now to assemble the protective cage

There are 3 types of protection cage with 3 different assembly procedures:

- the flexible system with fiberglass arch,
- the rigid cage made up of 2 sections, (classic frame)
- the cage in 4 parts with separate feet. (2016 and following frames)

To be clearer the following photos were taken without the engine, tank and harness.

### FLEX cage

Screw the upper conical spoke to the corresponding one left together with the sheath to form an inverted V.

Insert the two connecting tubes in the upper part of the frame.

The net must remain in front.







The flexible cage comes in a small tubular bag, do not throw it away, it will be useful later every time you need to disassemble the cage for transport, it takes little place in the pocket under the seat.

The protective arch is made up of 4 sectors of fiberglass rods connected in series with 3 steel tubes, all protected by a fabric sheath to which the high tenacity nylon net is sewn.

The net is stretched by a cord which, once assembled, is inside the cage circle; it is shorter than the outer rim, therefore the rim must be mounted and positioned **half at a time**



1- Insert the first rod on the central upper junction at the vertex of V. making sure that it must enter at least 3cm.,



2- do the same with the following rod.



Each of these rods must enter easily and make a decisive noise that proves to have reached the limit. If you do not reach the bottom, you do not have to bend it, if is not perfectly inside its slot you will irreparably damage the rod and/or the metal tube.

As you can see from the photo you need a lot of free space around the MINIPLANE.

Before bending the bow do this simple operation:  
push the end of the rod with one hand and pull the sheath with the other hand at the same time, shaking slightly up and down.

This will also help make sure you have inserted the rods all the way in.



3- Then to easily bend the bow you will have to grip it so as to accompany its end in its housing at the base of the frame with a continuous movement.

Look for a position that allows you to hold the MINIPLANE still because the elastic stick pushes a lot and would make it fall.

There are some precautions when doing this.

The bending of each semicircle must be carried out with a continuous movement from the beginning up to the insertion in the frame, without interruptions and especially without NEVER RELEASING THE GRIP.

These lightweight rods accumulate so much energy that will be released if you let them loose, they can take a lot of speed and become very dangerous for those accidentally hit.



The end of the rod enters the frame tube with some precision.

It will only go in easily if it has been precisely aligned first.

The strength of your wrist is not sufficient to reach the correct position, it will only be possible to do so if, as in the photo, you take the end with your hand and push down with your elbow.

Steps 1-2-3 must be repeated **one side at a time**, before being able to stretch the net.



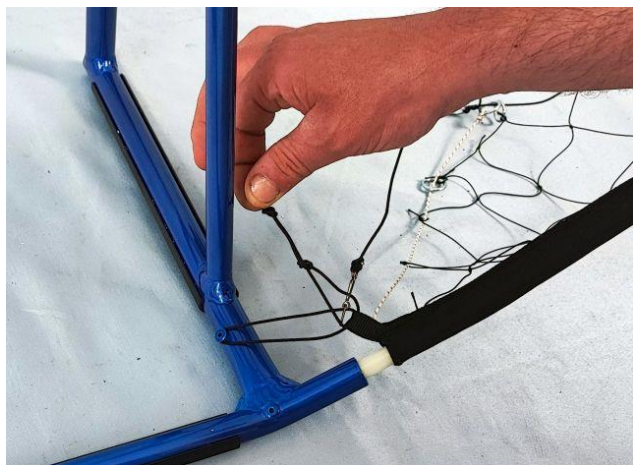
Screw the 4 lateral spokes to the frame, it will take about 10 turns, the first part of the pins is not threaded to guide the orientation and not to damage the thread.

The net must stay in front of each spoke.

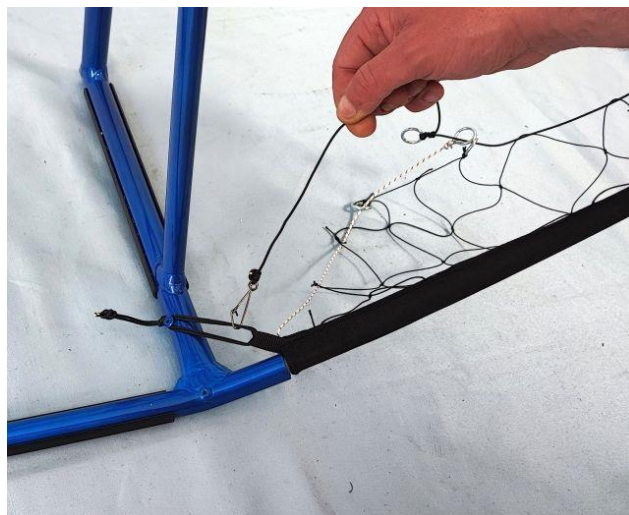


The ends of the spokes are simply inserted into the T-fittings, which are equipped with a mechanism that prevents them from coming out.

To be able to disassemble them, follow a sequence which is explained in the Disassembly chapter.



The sheath is stretched by a cord hooked to the frame with a double loop.



Until now the net has remained in order because the end of the tension cord was attached to the loop, with the small carabiner.

Now we have to free it.



1

The tensioning wire must be hooked to the frame starting from the rings, crossing it under the tank, then the remainder must be used to make a pulley that allow you to stretch the net very strongly with little effort.

In the following video it is much easier to understand than a written explanation.



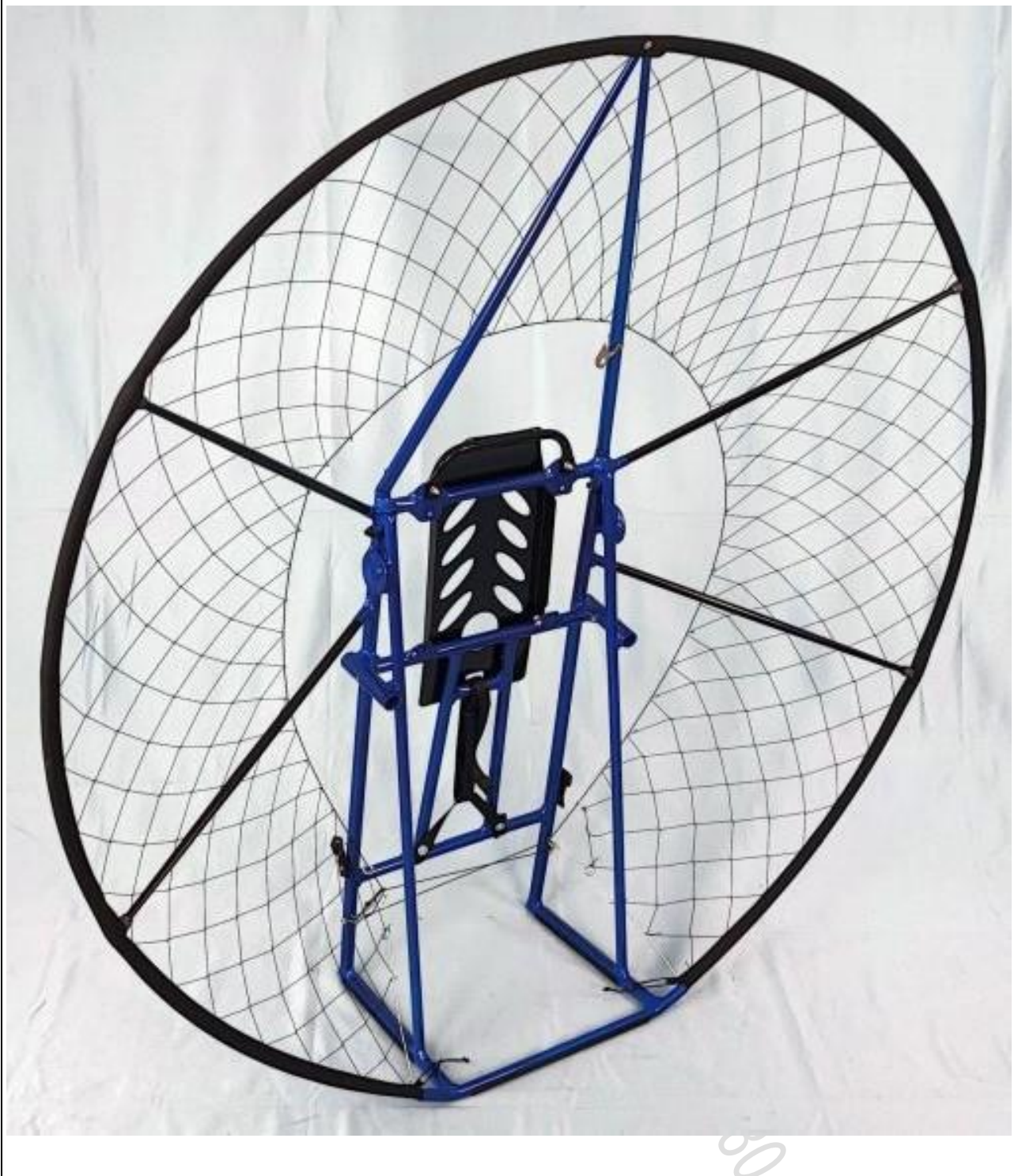
2



3

The tension line of the net setting video





## RIGID cage 2 parts

The two halves of the protective cage are shipped with the lower part disassembled.

The assembly begins by inserting the part into the rest of the cage and securing it with 2 self-tapping screws.



The half-cage is inserted on the frame from above, keeping it oriented forwards.

Then by pivoting on the inserted part, rotate the cage back until you find the correspondence of the holes in which the knob screws are to be screwed.

Leave the lower end free for now, it will be easier to align both screws in the threaded holes.



( front view)

Insert both screws before screwing them, the first part of the hole is without thread, pushing them in until you reach the threaded part will allow them to be aligned well and avoid damaging the thread when screwing.



After having screwed them in, he is prevented from unscrewing by wrapping the velcro around the tube and fixing the end on itself.

Insert the pins at the lower end of the two semicircles into the base of the frame and then the upper pin as explained on the following.

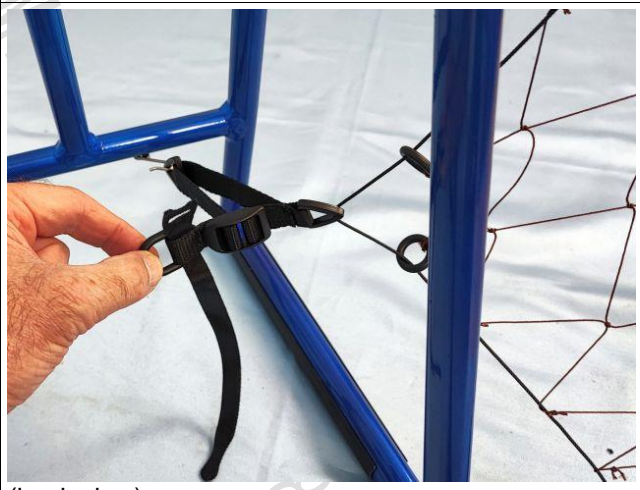


To insert the pin glued on the left side of the cage inside the corresponding profile on the right side, a slight force can be required to deform the arch a little and, exploiting its elasticity, to align the profiles well to facilitate insertion. Then it stops with the double-sided velcro, stretching it and making it adhere wrapping to itself.



(back view)

Before tightening the net tension cord, this ring is hooked into the small pin in the frame, it is used to hold the lower end of the cage in place.



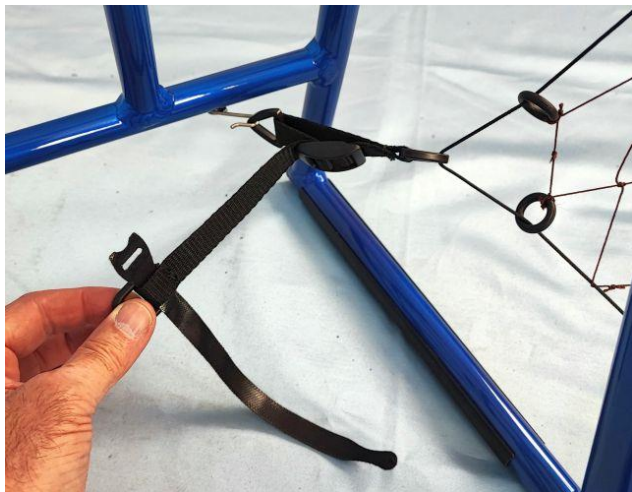
(back view)

This is the strap used to tension the cord and therefore the net.

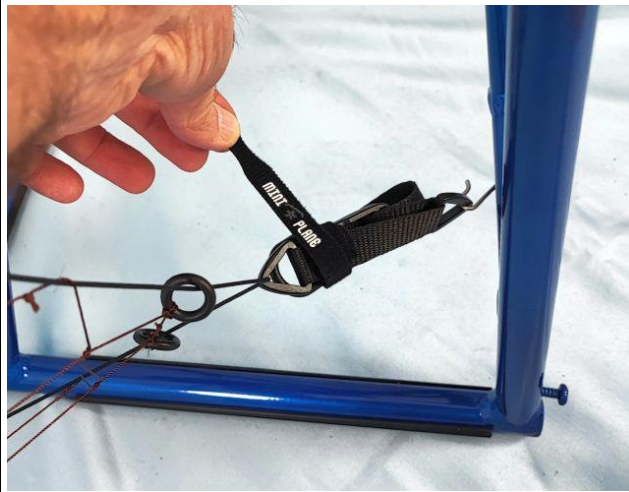
To make it more visible in these photos, the tank has been removed.

Hook the triangular buckle on the hook on the frame,





pulling the D buckle you can tension the net effortlessly.  
 There will remain a strap about 15 cm long which to avoid damage will have to be fixed



by rolling the velcro as you already know.  
 (right side view)

## RIGID cage 4 parts

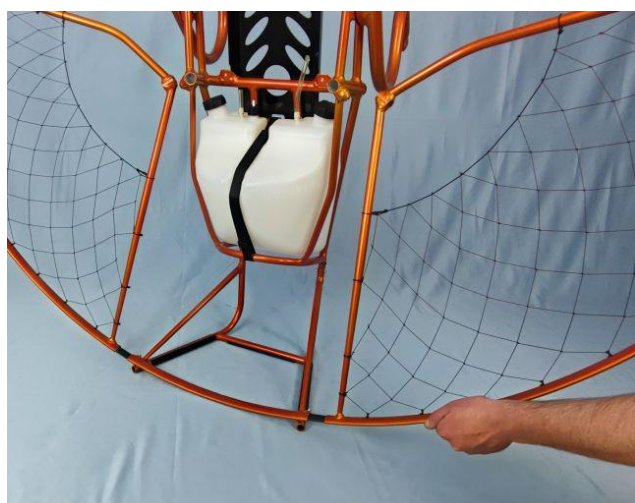
Cage 4 parts

## LR cage 4 parts

### MINIPLANE LR 4-part cage assembly sequence.

Begin by inserting your foot into the central frame.  
 Secure it with the screws or clips provided.  
 Put him on his feet.





Insert the two lower quarters



and **gently** lock them with the screwdriver (size PH1) and torque as indicated on the torque table (size: M4)



screw the butterfly screw.

To speed up the assembly only one part is threaded, the first part must only be pushed in and screwed only 8-10 turns at the end



The velcro that runs around the tube prevented the screw from unscrewing with the vibrations



New solution with sliding stopper.



Insert the 2 upper quarters, first on the frame, then on the lower cage.



Lastly, insert the central connector at the top. The connectors are quite precise, it may be necessary to force the parts a little to align them and facilitate insertion.



wrap the velcro straps



Insert the clips that permanently block the whole system

## D) PROPELLER

Lastly, we assemble the propeller which, being a fragile part, so far we have not unnecessarily exposed it to the possibility of being damaged.

In the first assembly and every time it is replaced the propeller must be mounted with some precautions to center it and to make it turn flat:

The assembly foresees the sequence:

1. gear box hub,
2. rubber disc, or the 3 or 6 cm plastic spacer (ONLY ONE, NOT BOTH),
3. propeller,
4. external flange propeller,

all held by A2 steel screws of adequate length and self-locking nuts .

The tightness is guaranteed by many years of experience, but it is imperative to use torque wrenches calibrated with the torques indicated below for the assembly.

If corrections are needed, tighten the fixing screws a little more (or less) in order to correct the error, taking advantage of the elasticity of the wood or the deformation of the spacer, it is possible to correct a maximum error of 1-2 mm measured on the propeller tip, you have to be careful to stay within a **torque of between 0.8 and 1.1 Kgm** without exceeding the maximum specified by the propeller manufacturer (some say 0.9 Kgm).

Never use a damaged or unbalanced propeller!

Attention during take-off, if you hear unexpected noises, vibrations or blows, it is likely that you have damaged the propeller, the flight must be stopped immediately.

Damage caused by vibrations can worsen and become noticeable even after a long time.

The blades are subjected to centrifugal accelerations exceeding 1000 G, a weight difference of only 1 gram causes vibrations of an intensity of over 1 kg at the rotation frequency of the propeller: a vibration sufficient to damage all the mechanical parts of the MINIPLANE .

The weight of an adhesive of only a few centimeters can unbalance the propeller

The propeller must not have chips or be blunt, the paint must be intact throughout the surface; in the event of cracks, during operation, the oil from the drain penetrates into the fibers of the wood or into those of the composite material, making subsequent repairs impossible.

The spare propeller can save you serious damage to the MINIPLANE.

When you park the MINIPLANE with the wooden propeller, it is advisable to keep it horizontally; in fact, leaving it vertical, the humidity that stagnates near the ground penetrates a blade and is able to unbalance a perfectly centered propeller. The wooden propeller deforms slightly as the humidity and temperature vary.

It is easy to have a confirmation of the correct centering : Once the engine has been started on the shoulder, accelerating slowly, an unbalanced propeller due to the vibrations that make the safety net shake, it is easy to understand if the vibrations follow the motor or that of the propeller rotation frequency.

Minor damage can be repaired in minutes, using cyanoacrylate glue (super-fast adhesive) and baking soda as a filler. If you think you can do it yourself, we can provide you with further information.

Good maintenance of the wooden propeller requires periodic repainting of the leading edge.

For more information, refer to the propeller manufacturer's manual.

If you need to disassemble the prop for transportation, it is much easier to disassemble the gearbox together, unscrewing the M8 nuts (with a 13mm hex wrench), faster, easier to reassemble, and no need to re-center the prop.

#### TRACKING CHECK

It is necessary to carefully check by turning the propeller by hand that the ends of the 2 blades pass exactly on the same point, on the same disc, with a tolerance of less than 1 mm.

## E) Throttle Control

We have decided to spend a chapter to this indispensable component because special attention must be paid to it.

The control handle is the only tool that allows you to keep the power and thrust of the engine under control.

An uncontrolled engine can be very dangerous.

The cable and the handle are parts that are very exposed to damage during transport.

The assembly must be carried out correctly and you do not miss the opportunity to check its efficiency.

The control system is made up of an internal cable that runs back and forth in a sheath and activates the carburetor by means of the lever and of an electrical part for switching off the engine.

During transport and installation of the MINIPLANE The control system can be damaged.

DO NOT force or pinch the cable on sharp edges or bends.

NEVER leaving the handle on the ground, it can be walked on or dirty with dust, sand or humidity.

DO NOT twist the control cable, if the handle is not oriented in a position that is comfortable for you, it can be adjusted from its end on the motor without forcing it (unscrewing and re-screwing the nuts).

The MINIPLANE control system offers excellent, enviable passive safety, it is built not to be able to transmit an extremely dangerous false acceleration command by pulling the sheath, which is mechanically locked at both ends, but it is still a mechanical system with structural limits.

In particular, the sheath can withstand a very high load in axial traction without damage, but it can be more easily damaged with a bending load at its extremity.

The assembly on the MINIPLANE is carried out in such a way as to exploit these characteristics.

If, upon visual inspection, the sheath does not come out perpendicular from the handle, it means that it has undergone a permanent deformation caused by an overload (unfortunately the most common is a stomp), even if in the rest position it could apparently work, it could instead be blocked when it is in the position of use.

The throttle control with this visible damage **MUST BE REPAIRED OR REPLACED.**

The construction system allows for easy repair with few tools and few essential technical skills.

To work in the best way, the cable must come out of the support on the motor in such a way as to form a curve as wide as possible and fixed on the frame with a velcro ring that only keeps it in guide, without blocking it completely.

This degree of freedom is necessary because the motor moves relative to the frame and the cable must remain free to move with vibrations.

The fixing point must be close to the center of rotation of the ABM arms or close to the pilot's shoulder in order not to be subjected to traction during the most common movements, UP and DOWN.

It must be checked that the assembly does not force the cable to rub against edges of the frame, engine or other components such as the fuel circuit.

## **F) PAINT IT!**

After the first assembly we advise you to take a few more minutes to mark with a very bright color indelible marker, in the aeronautical way, all the screws and nuts visible with a small mark astride the edge and the nearest firm surface.

This will help you. to drastically reduce checklist times by highlighting each screw or nut that has moved from its original position.

## **G) end-of-assembly check and pre flight check**

Everything you may have forgotten will cause you problems if you ignore this check.

We strongly recommend that you do it carefully, in silence and avoiding being distracted by close people, even if they are friends.

A safe way to carry out this check is to read it from a PRINTED personal list that we would like to advise you and which you can complete at your convenience according to your needs.

We have prepared an example list for you, you can find it at the end of this manual.

Per Il Volo snc - MINIPLANE - TOP80

## What you need to know for correct OPERATION

The TOP80 is a 2-stroke engine,

The fuel is petrol, the lubricant is an oil, they need to be pre-mixed, preferably in an external container (we recommend metal) before pouring it into the MINIPLANE tank.

From now on we will call it **mixture**.

Funnels or Pumps are used for the transfer (you can easily find gasoline pumps in the market, manual or electric, at the time of writing, for safety reason we recommend the manual ones).

We can supply these accessories, but as they are bulky, it is generally better to get them in the local market.

### Gasoline

The TOP80 does not require special fuels, normally commercial pump petrol has the suitable characteristics.

We performed tests with petrol with an octane number between 92 and 98 without any problems.

Normally we do not consider it necessary to use higher octane numbers, in some cases (depending on the country) even contraindicated.

However, in some markets, gasolines are composed of high percentages of bio alcohol that can cause problems when mixing with oil and even damage the engine components, in this case the most suitable fuels could be high octane aviation fuels.

The best information on the most suitable fuel in your country can be given to you by your local dealer.

### Oil

Use only mixing oil for 2 stroke !

We know you expect here to recommend a brand.

There are some variables that makes us avoid recommending one brand over another.

We have tested numerous brands of oils, intended for the most disparate uses, of very different prices, generally with good results, very rarely poor.

Sometimes we have not found a direct relationship between cost and results.

We believe that each producer offers in each country the best oil that can adapt to local gasolines, oil that works perfectly in one country does not always give the same results with gasoline produced in other countries.

Here we can only give you general indications to check if you have made the right choice.

The amount of oil that enters the engine also depends on the carburation; we estimate that there can be a variation of + -20%.



The necessary protection depends on the use of the engine, a more loaded propeller requires more oil, an engine that runs more "free" requires less.

We advise you to start with a percentage of oil not exceeding 2%, then you can gradually try to reduce it to 1.5% or even less.

If the propeller usually gets dirty with large drops of black tarry oil, a very easy sign to check: the most common reason is too much oil on the mixture, too rich carburation, or not the best oil for your engine.

It doesn't mean the oil is bad, it simply means it's not adapted for the use you are making of the engine, in fact every different combination of pilot / glider / weight / type of flight requires very variable powers or temperatures, this once again shows that you will have to find the ideal type of oil for you.

The right amount (together with the correct carburetion) normally does not leave excessive residues on the piston crown, which therefore does not need frequent decarbonization (or even none in hundreds of hours).

Once again, we advise you to follow the experiences of your local dealer who surely already has the answer.

## STARTING the TOP80 engine

It is a simple operation, which must be done with competence to avoid very serious consequences.

The MINIPLANE can provide a thrust of over 50 kg, once its weight of 20 kg is started it is not enough to keep it stably on the ground!

The end of the propeller reaches a speed of over 500Km / h.

Thanks to improvements in recent production, it has become easier to start, with less force, maneuvering the starter system can cause it to ignite even by people who do not know how to use it.

NO ONE who is not instructed on the use of the paramotor and on the specific characteristics of the MINIPLANE must be authorized to use it or even to fumble around it.

## PREPARATION

Prepare a sufficient quantity of mixed fuel for the intended use, do not overdo it, the prepared mixture changes chemical characteristics rapidly, keep the mixture you are not using in suitable hermetic metal containers.

### fill the tank

Petrol is easily flammable, some components contained in petrol are carcinogenic and can easily enter the body through the skin. This can also happen through breathing.

A simple operation such as pouring can cause very serious accidents if not carried out with due precautions. use suitable equipment to avoid spreading.

ALWAYS when you prepare the mixture or pour into and from the tank:

- carry out the operation in a free, open area,
- away from materials that can spread fires,
- have adequate fire extinguishers, and/or a fire blanket
- avoid electrostatic discharges and nearby fires, sparks or embers,
- do not smoke

After having unscrewed the cap.

Fill the tank with the amount of fuel suitable for your program plus an amount sufficient to carry out unexpected maneuvers or to allow you to reach landings other than the one planned.

Screw the cap back on, the cap must be reassembled precisely so as not to have leaks, which is necessary for subsequent operations.

To screw in correctly, the cap must be perfectly aligned in its seat on the tank.

There is a simple trick to do it:

place the cap in its seat, keeping the center of the cap slightly pushed down with a finger, unscrew it slowly with the other hand until you feel that it overcomes a step making a TOC, at this point the beginning of the thread on the cap and on the tank are perfectly synchronized, screwing from here we will have the certainty that it is going in the correct direction.

It takes a few turns to reach the stop, do not force excessively, only the necessary to prevent it from unscrewing with vibrations, the tank is not under pressure.

## **fill the fuel circuit and prime the carburetor**

Your TOP80 will always start on the first pull if you learn how to feed it correctly.

When the engine is running, it draws fuel from itself from the tank which, for safety reasons, is at a lower level.

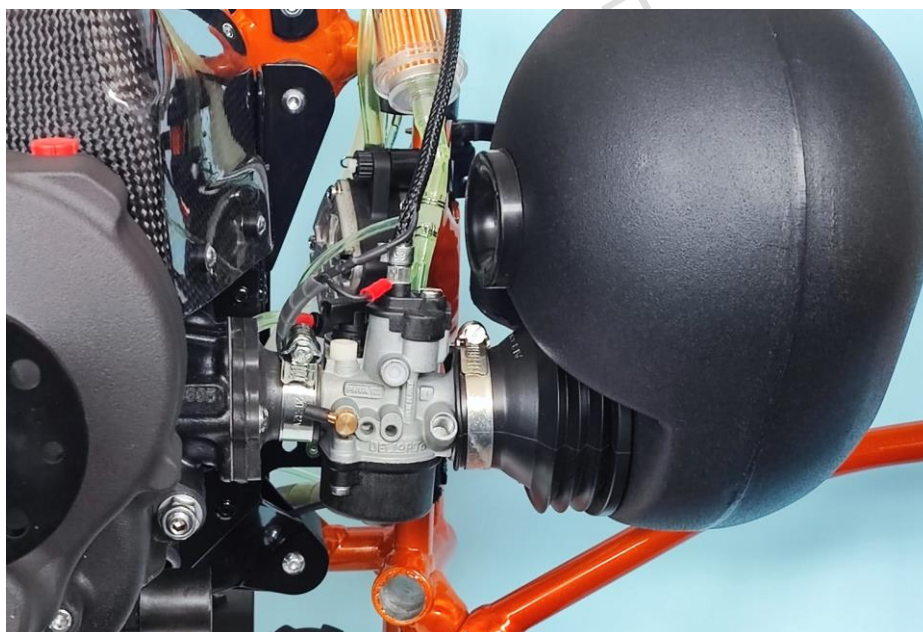
For starting, the fuel must be raised manually to make sure that it arrives and passes through the carburetor, and a small amount enters the engine.

We can do this with different systems according to the type of carburetor mounted in the MINIPLANE.

### ***Basin carburetor (Dell'orto)***

Press the priming pump 20-30 times until the carburetor basin (the black cup under the carburetor) is completely filled by about 10cc, once filled you will see the fuel level also rise toward the filter, it is not necessary to pump more.

We advise you to firmly pinch the pump cowl between two fingers from the side and not squeeze pressing it from top to bottom.



## ***Diaphragm carburetor (Walbro , Tillotson)***

Many longtime pilots are probably used to the nautical-style inline fuel pump.

This is a solution that we have never adopted on the MINIPLANE because it is a frequent source of leaking with consequent problems and damage to the engine.

We prefer to make the mixture rise by putting the tank under pressure.

To do this in the most recent version of the MINIPLANE, we use a manual air pump inserted on the tank vent EXCLUSIVELY for this function.

The pump must be removed immediately after loading the circuit, it must not be used with the engine running or for transport.

The pressure required is ridiculous, less than 1/20 of ATM, it is easily reached with the hand pump.

The amount of air required depends on the free space in the tank, a few pump strokes with a full tank or a few dozen with a half-empty tank may be enough.

To avoid unnecessary pumping, we advise you to do a simple operation to check that the caps have been screwed on correctly and therefore the tank is airtight.

Pump 5-10 times and immediately remove the pump from the fitting, if air comes out it makes a noise and is the confirmation that the tank holds the pressure, then reinsert the pump to continue the priming procedure.

Now the most important part:

the fuel rises only if the circuit is "opened" by pressing the special lever on the pump side of the carburetor.

It is generally very visible in red color.

It is necessary to observe the rising of the fuel inside the transparent tube until it reaches the carburetor, it is easier to do this by positioning yourself behind the paramotor, on the propeller side;

with the adequate pressure it can take some seconds.

When the fuel has reached the carburetor, we still insist 1-3 seconds to allow it to go all the way inside the carburetor and a very small amount to reach the crankcase as well.

- The maneuver described here is for an engine that has been stopped for a long time with the circuit and carburetor completely discharged
- if the engine has been started recently, the circuit is still full and the carburetor is certainly filled, generally the activation of the choke alone or even without it may be sufficient, otherwise there is the possibility of flooding the engine.

Your experience will help you find the best preparation on every occasion

## CHOKE

we explain the function of the choke and how it is used for a safe start on the MINIPLANE.

All internal combustion engines need a slightly “richer” fuel / air ratio in cold starting.

Remember that one of the components of the mixture is the lubricant which, after the engine has been stopped, may no longer be present in the parts that must be protected.

How much richer it should be also depends on the temperature of the engine and air.

For safety reasons, the activation of the choke allows the engine to perform only a few revolutions, not enough to increase the speed and engage the clutch.

Then the engine dies from lack of air.

We use this feature to propose our **safety start-up procedure** which we describe on the next page.

Remember that the choke can be used as an emergency stop

## SAFE START PROCEDURE

Unfortunately, we know that there are numerous accidents during ground starting, generally with the engine accelerating out of control, hitting the driver and nearby people.

These accidents are generally very serious and are statistically the most frequent in the practice of this sport.

If you follow the procedure here described, you can practically reduce the risks to zero.

The basic principle in this procedure is that you

**DO NOT NEED TO START AND WARM-UP THE ENGINE ON THE GROUND.**

- Load the circuit, and pull slowly the starter handle few times, to rotate the engine about ten revolutions, slowly pulling the ignition system will not be able to produce the spark and therefore the engine will not start, the purpose of this preparation is to circulate gasoline, lubricant and fresh air in the engine
- **WITH THE CHOKE ACTIVATED**, at the first energetic pull of the handle, the engine will produce the first spark and surely there will be the first explosions.
- Now you are sure that the engine is working, only one or few bangs are sufficient, the engine will stop by itself
- at this point your work with the engine on the ground is **finished**
- The **following actions** are done only with the **paramotor on the shoulder**
- When you have the paramotor on your shoulders, it will be practically impossible to reach the propeller with your hands or face and it will be easier to control it, a possible fall will certainly be less harmful than the paramotor leaning on the ground
- put the MINIPLANE on the shoulders and hook at least the chest strap
- only now the choke can be deactivated, it can be easily reached with the right hand
- than you are ready to start as described on the following page

Please consider this one which has confirmed its validity over many years of experience.

Certainly there are also other procedures that your instructor will recommend.

## START

Check everything again before to pull hard the handle.

EVERY time you restart the starting procedure, even if you stopped it and let go of the throttle handle for a few seconds, before pulling the handle, **check** that the accelerator lever returns freely to idle.

EVERY movement you have made could have damaged the control cable or handle.

At the first bursts the engine can recoil (kick back), starting it on the shoulder the handle could slip and hit your face, **use two hands** crossing them on the handle to reduce this risk.

Engine recoil can be more violent when pulling with little force or too slowly, a frequent possibility among beginners and less robust pilots.

To reduce this problem, the **elastic** system "**à la Carnet**" is available for the TOP80, a solution conceived by the well-known champion Michel Carnet.

Remember that the choke can be used as an emergency stop

## FLOODED ENGINE

Generally, it is not easy to cause the engine to flood, but especially with little experience It may happen that the priming procedure has caused too much fuel to enter the crankcase.

Flooding prevents combustion inside the combustion chamber due to excess fuel-to-air ratio.

Sometimes you can start the engine anyway by insisting a little to pull the starter handle and keeping the throttle completely open, to let in as much air as possible, but this must be done with due precautions: *first*, because, as mentioned, the accelerated engine can increase by spins very quickly and cause you to lose balance and control, *second*, excessive wear of the starting components can easily be caused.

Before deciding what to do we must learn to understand what are the symptoms that make us recognize the flooded engine, because even a too low fuel / air ratio can prevent combustion in the engine.

When unburned fuel comes out of the exhaust during engine rotation (in starting attempts), it can certainly be recognized by its characteristic odor.

By removing the spark plug, the wet appearance of the electrodes will give you certainty.

A useful thing at this point is to dry the spark plug: do it **EXCLUSIVELY** with paper or air, **DO NOT USE** abrasive materials, sandpaper, files or anything else.

At this point you must pay attention to a characteristic of the TOP80, the ignition system (the generator of the spark that ignites combustion) **DOES NOT SUPPORT** the overvoltage's, **BEFORE** pulling the starting handle

you must ALWAYS make sure that the spark plug is inserted in the pipe and that is perfectly grounded in the engine, IF YOU DON'T KNOW WHAT IT MEANS, GIVE UP THE OPERATION described below, even a few revolutions of the engine without the (electric) load can irreparably damage the ignition system that must be replaced.

#### UNFLOODING PROCEDURE

ONLY IF YOU ARE SURE that you have perfectly grounded the spark plug inserted in its pipe, pull the starter handle hard with the accelerator fully open, 10-20 times, there is no contraindication, with this procedure you do not damage the start mechanism. the engine runs fast without compression.

After this operation, refit the spark plug with the right torque, the engine will start at the first pull.

Another little tip that can solve some problems: IF during these rotations you do not smell unburnt gasoline or you do not see gasoline splashes out of the spark plug hole, it could mean that the engine WAS NOT FLOODED, probably was the opposite, the quantity of gasoline was not sufficient, but may be because it is old, of poor quality or full of humidity or there was an excessive quantity of oil in the mixture (all can happen after a long stop) we advise you in this case to cause an excess of fuel by activating the choke control and pulling hard 5- 10 times with the throttle fully open and then repeat the unflooding procedure as described.

#### WARM UP

If you have followed the priming procedure described above, it is likely that the engine is slightly "rich" and needs to be accelerated slightly by the throttle handle to facilitate the first explosions and maintained a short period of a few seconds until the carburation stabilizes.

At the end of the construction the engine is tested and adjusted with a standard calibration.

The idle calibration provides a speed of about 2000-2200 Revolution Per Minute, a lower speed the starting ratchets produce a characteristic noise (it is not dangerous, but causes wear), an higher speed (higher than 3000 RPM) engages the clutch and rotates the propeller.

If you need to change the setting, it must be done with the engine warm.

Accelerate slowly, around 20 seconds, until you reach about 7000 RPM, which corresponds to about half the thrust, about 25 Kg, be prepared for this thrust so as not to lose balance.

In this phase the engine it is very erratic, do not be alarmed, it is normal for a 2-stroke at the first acceleration.

Above 6000 RPM the throat will clear, irregular bangs and vibrations will disappear quickly.

Stay at the speed where the engine is "cleanest" and regular for about 1 minute, then you can test the full power, possibly to be checked with a tachometer for about 15- 20 seconds even before each take-off attempt.



Be careful, thrust may exceed 50 kg, according to the mounted propeller.

The engine warm-up can thus be considered finished.

## **BEFORE TAKING OFF**

Give the engine a full throttle for few seconds before take-off is necessary to ensure that the engine is ready to respond to the throttle command, in fact it is typical for a 2-stroke to decrease its response speed after staying a period of time at idle.

Since ground preparation to takeoff with running engine on your back may take several minutes, if you do it with the motor at idle, we advise you to retry few seconds "full throttle" before starting the take-off run.

This acceleration will help you a lot in inflating the glider.

Although the subject "flight technique" is not the purpose of this manual, we would like here to do a quick explanation of a technique that we are proud to have invented and spread it since the beginning of our history, because the flexible cage of our MINIPLANE and the "heavy" gliders of the early days required a particular technique.

The technique we call "pre-power launch" should not be confused with "power launch" (use of the engine during inflation) against which, if done correctly, we believe it offers security benefits.

Description:

- perfectly in the center and in axis with the glider with the lines just taut, or with very little run-up (according to the glider needs)
- give full throttle for at least 20 seconds, staying a little inclined forward to be sure that the accelerated flow of air passes just above the sail standing on the ground without hitting and lifting it, it is very important that the flow is perfectly centered on the axis of the glider and in the direction chosen for take-off.
- release the accelerator to idle when you start inflation (which is therefore carried out without the contribution of the engine),
- Accelerate again as soon as you confirm, by observing the glider, that the inflation has been successful and the direction is as desired.

at least 15-20 seconds of engine at maximum move a large mass of air also around the cone of air exiting the propeller and this mass continues even for a few seconds after you stop accelerating, creating a local wind situation for a time sufficient for good inflation

## Engine RUN IN

one of the important steps to ensure a long engine life is the running in.

The **TOP80** is **not** an engine that **needs a long run-in**, but equally we recommend caution in the first hours of use.

We recommend approximately 30 minutes of ground operation before using it in flight, performed in sections of about 10 minutes, leaving a sufficient break between them to cool down the engine (about half an hour).

A longer ground run is not necessary, rather it is harmful to the engine and dangerous to the pilot.

During this time the engine must be brought progressively to high speed, checking the correct carburetion with acceleration variations of less than 10 seconds, paying attention to abnormal noises or vibrations.

The purpose of running-in is not just to make the components fit as commonly believed, but rather to check if everything is working well, avoiding serious damage that could be evident and corrected in the first few minutes of operation without causing consequences.

During the running-in there will also be an opportunity to check if the assembly has been carried out correctly by checking all the mechanical parts in movement and not.

So once again we recommend that you pay attention to the behavior of the engine, this will increase the level of confidence with the vehicle that you will then use for a long time and that will give you a lot of satisfaction.

Why do we advise **against** a long break-in on the ground?

The running-in must be done with the load (the propeller) otherwise it is useless.

the propeller moves a large amount of air that raises dust and debris from the ground which then pass through the propeller ruining it and sucked in by the engine, the consequences we leave you to imagine.

**Carefully follow the start-up procedures we have designed for your safety and those around you.**

**The procedure described here (link) involves checking the first ignition of the engine on the ground with the choke active which prevents it from rising dangerously in revs and then restarting the engine with the choke open only after putting it on the shoulder.**

**Unfortunately, even very serious accidents are frequent by those who do not follow this procedure exactly.**

## DISASSEMBLY for TRANSPORT

Disassembly must be performed without haste, because it will be advisable to take advantage of this opportunity for an accurate **post flight check**.

The related check list that we recommend is at the end of this manual.

Naturally, it will be your responsibility to adapt it to your needs also in consideration of the disassembly and transport method you have chosen.

The Miniplane can be disassembled in various ways to reduce its bulk and facilitate its transport.

If you will not be using the paramotor again in a few days, we recommend that you remove the mixture from the tank, to reduce odor, toxicity and spillage problems.

Use the same precautions already used for filling.

To preserve the characteristics of the fuel, preferably keep it in a metal tank

## Propeller

If the propeller is an obstacle to transport, we advise you not to disassemble it from the gear box, it is preferable instead to remove the entire reducer by unscrewing the two M8 nuts (13mm wrench) that keep it fixed to the engine casing.

There are several advantages:

- it is much easier
- faster
- without the need to re-center the prop, which you should do if you unscrew it from the 4 screws on the hub
- less risk of making assembly errors

Many versions of the TOP80 have a centering ring between the crankcase and the gearbox, be careful not to lose it.

The latest versions of the engine (black casing) DO NOT have a centering ring.

## Arms and harness

If you have front clearance problems with the **ABM** solution, we advise you to fold the arms upwards.

After releasing the shoulder straps from the frame, that are equipped with a very effective safety red button buckle, the arms are free to rotate upward without limit.

This will also prevent the harness from rubbing on the ground.

The **PSF** solution has arms that can easily be removed from the frame after removing the safety pin.

Also in this case we recommend that you secure the harness at a high point on the frame that keeps it off the ground.

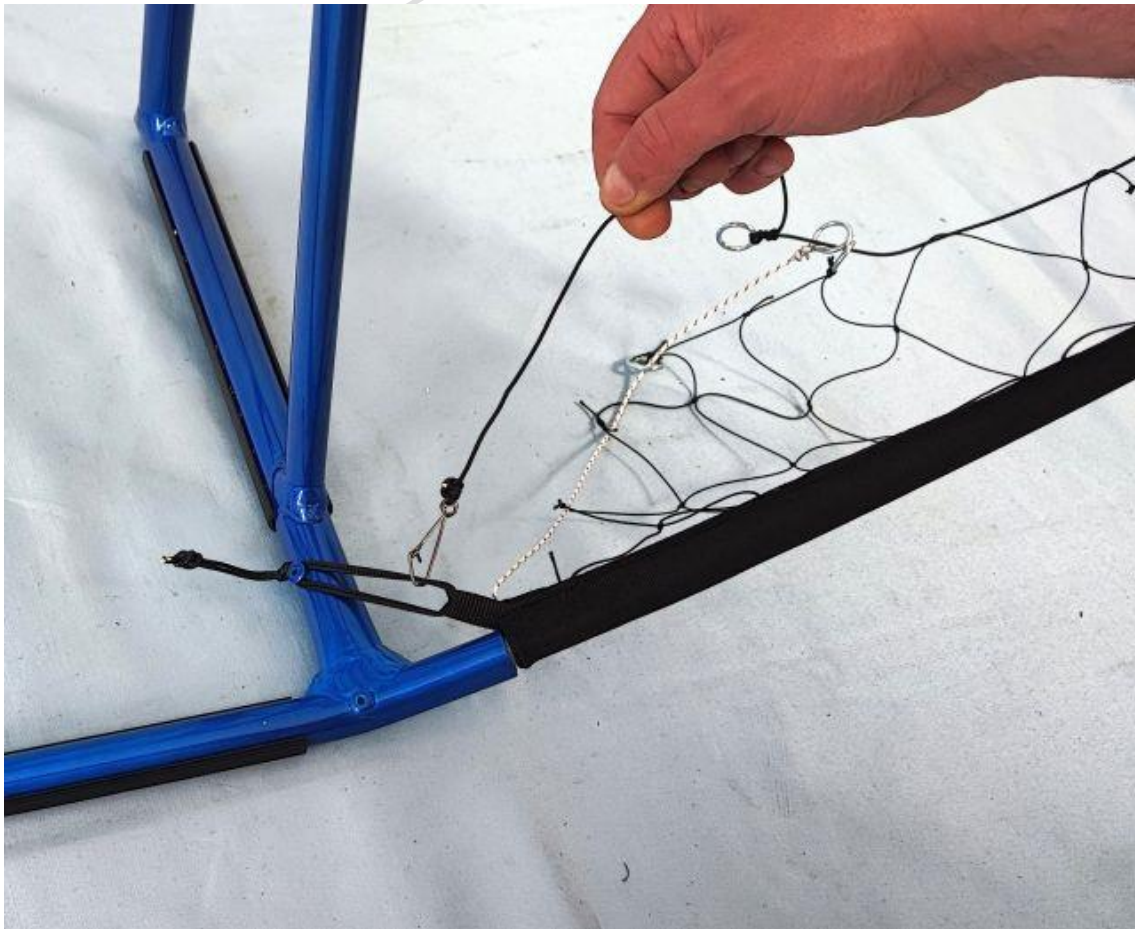
## Cage

### Flexible

We advise you to find a sufficiently large, free space and make sure that no one is near when you remove the elastic splints of the arc, which you had assembled using a lot of energy, if they slip from your hands this energy is discharged violently and can be very dangerous for the people who were hit.

The sequence to follow is this:

1. unhook the ends of the tensioning wire from the hooks on the frame, one at a time both ends
2. the small carabiner on the end of the wire is hooked onto the tensioning wire of the sheath, so the net will remain in order, it will not be able to form knots.



3. disconnect the four T4 connectors from the tapered spokes, there is a precise way to do it easily, inside the connector there are teeth that hook into the inserted rod preventing it from coming out, the more you pull the more you plant, the only way to unhook them is to press the red / orange ring first and KEEP IT PRESSED and then pull the connector outwards.

4. Remove the fiberglass elastic sticks from the base of the frame, the ones that form the circle, to do this it is useful to remember how it was assembled.

The stick is inserted into the frame tube, the frame holds it oriented in the right direction to achieve the curvature.

The stick tends to straighten and thus creates a very strong friction that prevents it from coming out, to remove it you must first align it perfectly by discharging the force that straightens it.

You have to do this by gripping the end of the stick near the frame and pushing down with the elbow resting on the curve, you will not be able to do it with the strength of your wrist only, in the same way it was mounted.

5. The stick is then accompanied upwards, up to the resting position very carefully, by rotating the arm. No one is to be near during this stage.

Further explanation is needed for your safety:

- to orient the batten, you push downwards at a point away from the support surface of the paramotor, which will therefore tend to fall towards you,
- during the rotation the thrust will be lateral, than the paramotor will move away from you,
- During these operations, without interruptions, you must always hold the frame with the other hand, or, if you deem it necessary, ask for the help of another person who can only stay in front or behind the frame, away from the propeller plane.

6. The protection arch is made up of 4 sections, 2 on the right and 2 on the left, the right and left parts must be disassembled independently, the tensioning cable is not long enough to allow you to do it simultaneously.



Remove the external section (the one you have just removed from the base) from the internal section (the one that reaches the top) for about 10 cm by sliding it inside the black sheath, the junction is about halfway and can be easily found by feeling it because it forms a small bulge on the sheath. The joint will remain in the upper batten.

## Rigid

It should be easy to follow the reverse order of assembly.

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## MAINTENANCE TIMETABLE

DEADLINES	INSPECTIONS	TO REPLACE
DURING AND AFTER RUNNING-IN	by sight all the screws and the seal of the motor head after the removal of the air conveyer.	
<b>before each engine starting</b>	<b>remember the check list, see also : engine starting</b>	
after first 5 hours	all the screws (remember the 4 screws inside the air conveyer) >	
after first 10 hours	Drain out the gear oil, check and clean the magnetic tap for metal parts	refill with 50 cc of 80-140 grade oil
every 25 hours	<ul style="list-style-type: none"> <li>• Guarding net</li> <li>• propeller: inspections</li> <li>• Inside cleaning of the pressurized gas pipe (only for float-type carburetor)</li> <li>• muffler shock absorbers</li> </ul>	
<b>deadlines</b>	<b>TO CHECK</b>	<b>TO REPLACE</b>
every 50 hrs.	<ul style="list-style-type: none"> <li>• intake reeds (elasticity and sealing)</li> <li>• cleanliness around the clutch bell</li> <li>• cleaning and/or decarbonizing of the head and piston</li> <li>• piston ring sealing</li> </ul>	<ul style="list-style-type: none"> <li>• spark plug</li> <li>• gear oil - 50 cc of 80 140 grade gear oil</li> <li>• piston ring, (following the result of compression test)</li> </ul>

	(compression test)  • spark cap	
every 100 hrs.	<ul style="list-style-type: none"> <li>• crankshaft sealers</li> <li>• crankshaft roller bearing (tolerance and noise)</li> <li>• clutch diameter and clearance</li> <li>• string, springs and plastic parts of the starter system</li> <li>• roughness and bore of the cylinder. May be necessary a polishing and a new piston with the adequate size</li> </ul>	<ul style="list-style-type: none"> <li>• piston roller-cage bearing</li> <li>• piston ring</li> <li>• propeller screws and nuts</li> <li>• clutch connectors and springs (2 pads version)</li> <li>• gear box oil (50 cc grade 80-140)</li> </ul>
every 150/200 hrs.	<ul style="list-style-type: none"> <li>• ball bearings (tolerance and noise)</li> </ul>	<ul style="list-style-type: none"> <li>• piston</li> <li>• crankshaft sealers</li> <li>• cooling fan</li> </ul>
every one year (even if the engine has not been used)	<ul style="list-style-type: none"> <li>• gas line (hoses, filter) and/or carburetor diaphragms</li> <li>• crankshaft sealers</li> <li>• all plastic parts</li> <li>• wood propeller</li> </ul>	<ul style="list-style-type: none"> <li>• rubber shock absorbers</li> <li>• gasoline pipes</li> </ul>
<b>DEADLINES</b>	<b>INSPECTIONS</b>	<b>TO REPLACE</b>



## HARNESS life and maintenance

The **harness** is the only **indispensable** paramotor part.

Its importance for safety is too often ignored or underestimated.

Originally it is designed, built and tested with sophisticated materials, mechanical components and construction techniques that guarantee the passing of severe load tests with deliberately exaggerated safety coefficients to eliminate any doubts about its mechanical resistance in every possible load direction, even in those that we know are really unattainable in flight (negative load for example).

Like any part built with synthetic materials it has a limited life.

Unfortunately, the life time of a harness cannot be accurately predicted and neither is it possible to carry out tests to verify its aging..

While, for example, there are universally recognized parameters for testing paragliders, at the time of writing it is not possible to carry out similar tests on harnesses.

The only possible tests for harnesses is destructive and render them unusable.

The reasons of premature aging which causes the loss of mechanical resistance characteristics of synthetic materials are well known.

There are many things you can do to extend the life of your harness:

- avoid unnecessary **exposure to the sun**, we know that an exposure of each few hundred hours can decrease the tensile strength of many synthetic materials by more than 50%.
- avoid excessive **cold**, example by leaving it in a garage in freezing temperatures when wet
- Avoid excessive **heat**, example inside a car or behind a window under the sun.
- avoid excessive **humidity** or store it **wet** after accidental rain
- avoid the **saline environment** and immersion in **sea water**, in this case it would be necessary a very thorough but gentle washing with fresh water, in order to prevent the crystallization of the salt in the internal fibers of the belts, a decidedly difficult procedure with uncertain results
- avoid **abrasive dust**, for example by transporting the machine on a bike rack behind the car, the raised dust is fine and very abrasive (silicon grains that commonly make up the asphalt) and sneaks inside the porosity of the fabric and belts , which then corrode the yarns with movement.
- avoid excessive **loads**, use for acrobatic maneuvers or functions other than the paramotoring is not foreseen.

The proper functioning of the **buckles**, both when opening and closing, can be hindered by the presence of **dust, sand and ice**. Keep them clean, don't use lubricant on the moving parts.

Take care not to let the leg buckles crawl on the ground when you park the MINIPLANE or when you move it.

If a quick buckle does not close properly even accidentally, it **MUST BE REPLACED**.

If you need to leave the MINIPLANE mounted in the field waiting for the flight we have a cover bag in our online catalog that protects against ultraviolet rays.

Visit Miniplane Shop <http://shop.miniplane.it/en/>

The harness mounted on the MINIPLANE could be damaged during transport or as a result of a fall, in this case you will have to carefully check the fabric details and especially the more exposed straps in these cases.

No stitching, fabrics, belts or straps should show signs of warping or fraying.

We recommend having the harness checked by competent centers, glider revise centers after 5 years and every subsequent year.

We believe it is reasonable to consider an average life of 10 years, then the harness must be replaced.

As already mentioned, these deadlines are very influenced by the way it was used.

If you think you often enter the risk conditions described above, the times should be divided by 2 or 3.

If instead you are sure you have the best care of your harness you can, under your responsibility, lengthen the intervals.

However, a paragliding test center, to which we advise you to contact periodically, with the experience acquired, can give you good advice.

## LOCKING TORQUE TABLE

bolts and nuts	Metric thread	metric wrench (mm)	Metric torque N.m	lbf.in
<b>motor cylinder-head studs</b> (4 nuts on the head, under the cylinder cooling cap)	M6	hexagon 10	9 do check for the symmetric fastening.	80
Prop	M6	Allen 5 - hexagon 10	9 / 11 go to prop setting	80 - 100
engine and exhaust elastic mountings	M6	Allen 4	10	90
	M8	hex 13 or Allen 6	15	140
<b>special directions :</b> do not twist the rubber mounting while screwing, do not use screws longer than the standard ones, the screw thread must not enter inside more than 8 mm (if M8) or 6mm (if M6)				
5 mm fastening for diaphragm carburetor and plastic flange	M5	Allen 4 or hex 8	4	
crankshaft nuts (clutch and ignition flywheel)	M 10 x 1,25	hexagon wrench 17	35 right screw thread	330
spark plug	please refer to manufacturer manual -all TOP80 with M14 plug need a 2 mm added washer, or 2,5 or 3 mm with very poor octan number, it is necessary following the elimination of lead from petrol - all TOP80 with M10 plug DON'T need added washer			
muffler flange	M6	hexagon wrench 10	hand fasten and stops 2 mm before the full compression of the spring in order to leave some elasticity	
gear box breather and drain caps	M10		8	70
miscellaneous	4 mm		2,5 - 3	
	5 mm		4 - 5	
	6 mm diameter		9 - 11	
	8 mm diameter		20 - 24	
<b>attention:</b> reduce by 50% with screws made of aluminum or short threads on aluminum, reduce by 60% with screw on plastic				

## Characteristics of SPARE PARTS for maintenance

Spark plug	M14 NGK : BR9ES or equivalent , add a 2 or 3 mm washer M10 NGK : BR9EIX -	Electrode gap 0,5 -0,6 mm
gear box oil	80-140 grade	50 cc (30-35 grams)
Petrol	92-95 octan	Pre- Mixed with 2 stroke oil
Pre-mixOil	Jaso FD	

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## CHECK LISTS

The check list must be done by reading the list and step by step touching, pulling, twisting or moving each named detail.

### END – OF - ASSEMBLY CHECK

Do this **every time you reassemble the machine** after transport, before taking the machine to the take-off point.

Once it's done correctly it will not be necessary to repeat it before take-off.

### FRONT CHECK

MAIN CARABINERS hooking, state of use, positioning, opening and closing functionality  
(the adjustments of the attachment points are described in the chapter assembly>Harnesses)

(ABM) ATTACHMENT STRAP and safety strap to the harness

(ABM) move the SWING ARMS up and down, also forcing laterally to check that they are correctly screwed

(PSF) J BARS, check the insertion in the frame and the presence of the stop pins

#### HARNESS

-(ABM) integrity and safe ring of the BOW SHACKLES

-(PSF) anchoring to the arm

-straps and QUICK BUCKLES status

-POCKET closure

-The excess part of the adjustable straps must be constrained so as not to flap with the wind or reach the propeller

-BUCKLES for fixing to the frame hooked and adjusted (see the harness chapter)

-absence of knotted or twisted BELTS

-SPEED BAR (if present), fix it to the harness with the special Velcro to prevent accidental fall, pulley free, secure the hooks (when not attached to the wing) so that they cannot reach the propeller

THROTTLE CONTROL, operation, return to idle, visual check integrity, fix it in an accessible, protected point that cannot accidentally fall to the ground

starter handle PULLEY attached to the frame, oriented handle and safety elastic wire attached to the harness

GENERAL VISUAL CHECK OF THE FRAME , cage form, stability on the ground

## **REAR CHECK**

solidity, stability, CAGE fixing

NET tensioning

Fuel MIXTURE quantity, no leaking

Tank CAPS screwed on

TANK BREATHER free

TANK FASTENING BELT solidity, well overlapped velcro

## **ENGINE CHECK**

AIR FILTER, mounting and support

SCREWS , BOLTS and NUTS, pay attention to the markers, touch and try to move the reachable screws and nuts

MUFFLER fixing and any safety cables

Engine fixing solidity with SILENT BLOCKS check by levering the propeller hub

SPARK PLUG and HT Lead

Check state of use, cleaning and PROPELLER fixing

GEAR BOX: by turning the propeller by hand, check for abnormal noises, jamming or oil leaks

VISUAL INSPECTION of the entire machine.



now you may say to yourself: “well done”!

## **PRE ENGINE START CHECK**

Throttle sheath check, not twisted, no bends or constrictions when the pilot is in position

THROTTLE HANDLE control, return at IDLE.

Put the MINIPLANE on your SHOULDERS and close harness straps

Make sure you have plenty of space around you, free from obstacles or people

"CLEAR PROP" aloud, must be audible to anyone who accidentally approached

## PRE Flight Check List

The pre-flight checklist must be followed without interruption, if for some reason, error, distraction or you find a problem to be solved, you stop, we advise you to start from the beginning.

Incomplete checklist is the second leading cause of flight accidents.

This is the most important list and the one you will have to adapt yourself to your needs, the one we propose is an example.

- Wind and weather – are they still suitable for YOUR level of flying experience and ability?
- Helmet & Harness – ensure all buckles are correctly fastened and set to the correct position
- Instruments – switch on and check operation
- Performance limitations – do you have enough room to launch safely?
- Security – Check all straps and pockets are closed, ensure nothing can be drawn into the prop!
- Motor – CLEAR PROP, check your throttle for full and free movement, after starting, check the kill switch is functioning correctly.
- All Clear above and behind?
- Controls – Check the risers are connected properly, the trimmer positions and speed bar are in the right place, then take the control handles and risers in your hands.
- Emergency procedures – have a plan for all eventualities!

## AFTER USE CHECK

to do before the disassembling or use.

- Have a good look around the entire machine, checking for any loose screws, nuts or connections.
- Check the condition of the fuel system for leaks
- Clean the propeller and if necessary the machine before storing