



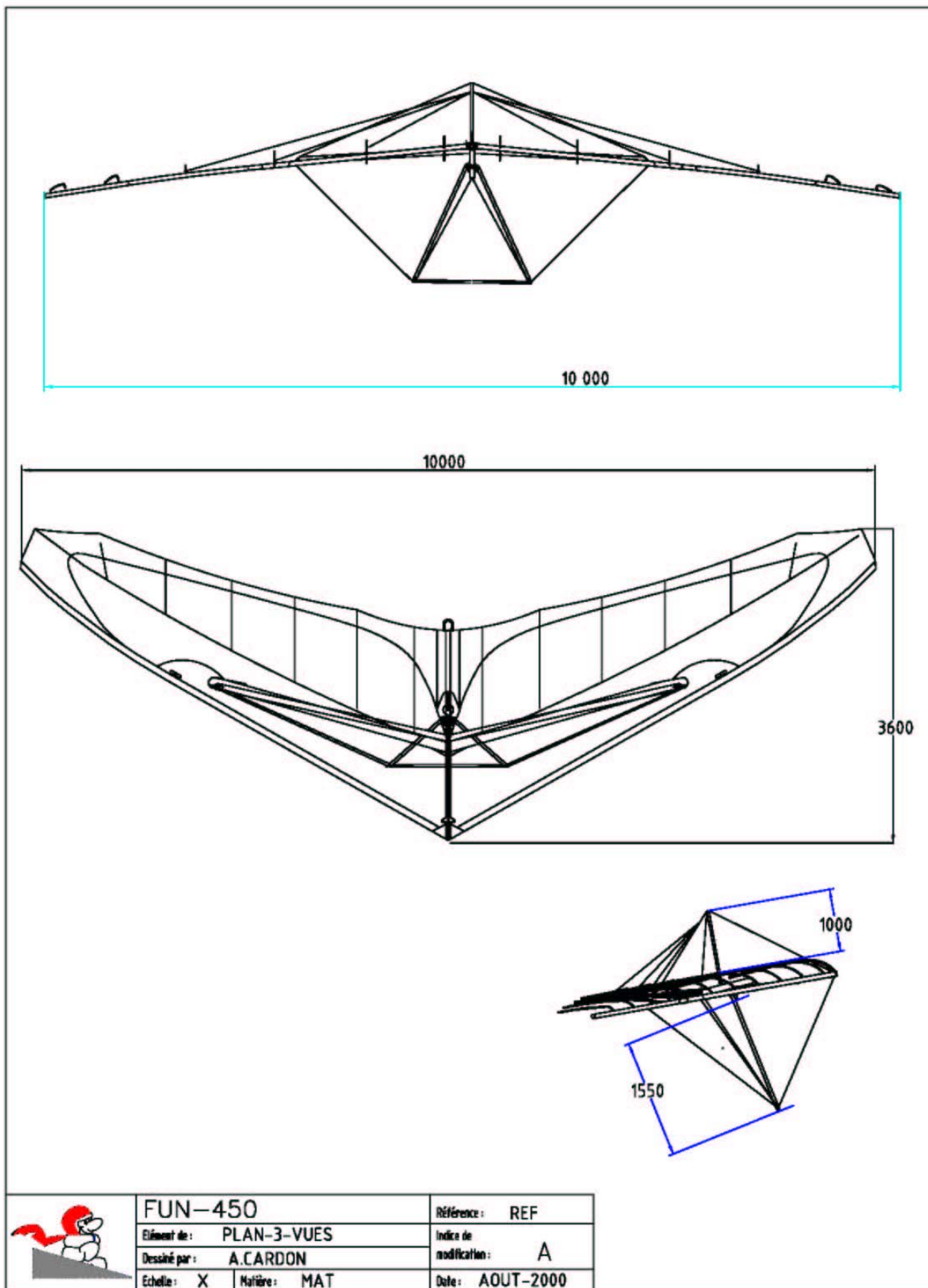
INSTRUCTION AND MAINTENANCE HANDBOOK

Wing Type

FUN 450

- I) **Drawings**
- II) **Technical specifications - Performances**
- III) **Instructions for use**
- IV) **Maintenance**

I) Drawings



II) Technical Specifications - Performances

a) Technical specifications

Area	17.4 sq.m. (187 sq.ft.)
Airfoil type	Double surface 30%
Span	10 m (33 ft)
Nose angle	120°
Aspect ratio	5,7
Empty weight	45 kg (99 lbs)
Ultimate load factors	+ 6g - 3g
Maximum take-off weight	450 kg (992 lbs)
Limit load factors	+ 4g - 0g (- 2g under gust)

b) Maximum added load/ trikes adjustment

The maximum load that may be added under the wing is **405 kg (lbs)**. The following chart defines the useful load of our various trike models with the Fun 450 wing.

	TWIN 503 (SL)	TWIN 582 SL (BUGGY)	GTE 503 SE/S	GTE 582 SE/S (CLIPPER)	GTE 912 SE/S (CLIPPER)	a.r.v TANARG 582	a.r.v TANARG 582
Empty weight (without options)	150 kg 331 lbs (158 kg) (348 lbs)	165 kg 364 lbs (177 kg) (390 lbs)	175 kg (390 lbs)	184 kg 406 lbs (195 kg) (430 lbs)	218 kg 481 lbs (226 kg) (498 lbs)	212 kg 471 lbs	231 kg 509 lbs
Maximum empty weight*	275 kg 606 lbs	277 kg 611 lbs	275 kg 606 lbs	277 kg 611 lbs	279 kg 615 lbs	285 kg 633 lbs	286 kg 631 lbs
Useful load (without options)	293 kg 646 lbs (285 kg) (628 lbs)	278 kg 613 lbs (266 kg) (586 lbs)	268 kg (591 lbs)	259 kg 571 lbs (248 kg) (547 lbs)	225 kg 496 lbs (217 kg) (478 lbs)	238 kg 529 lbs	219 kg 487 lbs
MTOW	443 kg 977 lbs	443 kg 977 lbs	443 kg 977 lbs	443 kg 977 lbs	443 kg 977 lbs	450 kg 992 lbs	450 kg 992 lbs

* optional equipment excluded

CAUTION: fitting of any equipment or any other change should never lead to exceeding the maximum empty weight value mentioned above, according to security standards and aircraft conformity.

It is possible to adapt other trikes than the ones mentioned above. Their maximum weight should be under 405 kg (875 lbs), once loaded. **The stability of the trike only in yaw must be absolutely positive** in order to guarantee the stability at high speed.

Then progressive tests will be performed to check the adaptation wing / trike, especially concerning the position of the control bar and the thrust line height. The necessary engine power for safe two-seater flight should be at least 50 HP. **Check during fitting whether the trike propeller stays clear of the lower rear longitudinal cables and the keel. A minimum clearance of 5 cm (inches) should be respected when the hang point is set to the front position and the wing is at its most nose up and banked position.**

c) Performance at maximum take-off weight

TRIKE	TWIN 503	TWIN GTE 503 SL/SE/S	TWIN GTE 582 SL/SE/S (BUGGY CLIPPER)	GTE 912 SE/S (CLIPPER)	arv TANARG 582	arv TANARG 912
Stall speed	55 km/h	55 km/h	55 km/h	55 km/h	55 km/h	55 km/h
	34 mph	34 mph	34 mph	34 mph	34 mph	34 mph
Minimum speed	60 km/h	60 km/h	60 km/h	60 km/h	60 km/h	60 km/h
	37 mph	37 mph	37 mph	37 mph	37 mph	37 mph
Recommended climbing speed	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h
	44 mph	44 mph	44 mph	44 mph	44 mph	44 mph
Take-off run	60 m	65 m	50 m	50 m	50 m	50 m
	197 ft	213 ft	164 ft	164 ft	164 ft	164 ft
50 ft clearing distance	145 m	150 m	130 m	120 m	130 m	120 m
	476 ft	492 ft	427 ft	394 ft	427 ft	394 ft
Climb rate	2,5 m/s	2,5 m/s	3,5 m/s	4,5 m/s	3,5 m/s	4,5 m/s
	492 ft/mn	492 ft/mn	689 ft/mn	886 ft/mn	689 ft/mn	886 ft/mn
Recommended approach speed	75 km/h	75 km/h	75 km/h	75 km/h	75 km/h	75 km/h
	47 mph	47 mph	47 mph	47 mph	47 mph	47 mph
Landing distance from 50 ft height	160 m	160 m	160 m	160 m	150 m	150 m
	525 ft	525 ft	525 ft	525 ft	525 ft	525 ft
			(165 m) (541 ft)	(165 m) (541 ft)		
Max L/D ratio	6	6	6 (6,5)	6 (6,5)	6,5	6,5
Max glide ratio speed	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h	70 km/h
	44 mph	44 mph	44 mph	44 mph	44 mph	44 mph
Side wind limits	10 kts	10 kts	10 kts	10 kts	10 kts	10 kts
V.N.E. (velocity never exceed)	130 km/h	130 km/h	130 km/h	130 km/h	130 km/h	130 km/h
	81 mph	81 mph	81 mph	81 mph	81 mph	81 mph
V.max (never to be exceeded in very turbulent air)	90 km/h	90 km/h	90 km/h	90 km/h	90 km/h	90 km/h
	56 mph	56 mph	56 mph	56 mph	56 mph	56 mph
Roll rate at 120% V min. (45° / 45°)	3,5 s	3,5 s	3,5 s	3,5 s	3,5 s	3,5 s

III) Instructions for use

a) Assembling - Dismantling

- Open the wing bag, make sure that the A-frame is on top, and remove fastenings and packing.
- Assemble the A-frame with the push-pin. Cables must not pass through the inside.
- Turn the wing over, and carefully open the two half wings to their maximum extent.
- Fit the king post onto its locating lug, take care that the tensioning cables do not entangle.
- Fit the king post nylon head at the top of the kingpost without entangling luff lines.
- Carefully slide the upper sail bent battens in their respective pockets and secure them with the doubled ropes. Do not force the battens during the assembly.
- Place the two straight battens of the wing on the lug at the extremity of the leading edge. Carefully check, with the help of the graded scale set on the leading edge tube at the end of the wing, the correct framing (sail tensioning screw in the axis of the keel) of the pivoting sleeves of the leading edge before tightening the strings.
- Slip the cross tubes swan catch tensioner through the opening between the king post and the trailing edge, pull to hook it on the rail screw tensioning at the keel tip. To ease the operation carefully center the A-frame, **ensure that the tabs and heat shrink coverings of the lower lateral cables do not get stuck in the sail opening at the cross tube-to-leading edge connection and that the stainless steel tabs line up with the control bar.**
- Pull down the swan catch tension lever and fix it in the rail with the push-pin.
- Raise the nose of the wing and lift it on its A-frame.
- Fix the front lower longitudinal cables in the rail under the nose plate with the help of the tension lever and the pushpin.
- When connecting the trike, slip the security fastening cable into the security strap at the king post level, make a turn backward around the king post, slip it again through the security strap, and then fix it on the upper beam of the trike. The security cable should pass under the tensioning cables. This operation secures connecting of the trike as well as fastening of the crossbar tensioning system.
- Fix the nose bonnet with the Velcro patches (essential point see "c" flight specifications).

Dismantling is carried out in reverse order of the assembling operations. ***Before folding up the two half-wings***, place the leather cap on the tensioning device lever and pass it through the upper sail aperture at the front of the post bottom to avoid tearing any part of the sail or the structure while closing the leading edges.

b) Preflight-check

A preflight check is essential before lifting the wing above the trike. To do so, position the wing horizontally once coupled with the trike.

- Check the camber of the two leading edges and correct positioning of the nose bonnet.
- Check the thimbles and nicopress of the front lower longitudinal cables and the correct fastening of the tensioning device and its pushpin.
- Slide your hand along the leading edges to check for possible defects.
- Check the crossbar/leading edges connection by unzipping the lower surface access. Check the right positioning of the lateral cables, the condition of these cables and their nicopress and the sail not being snagged on a metallic part.
- Check the fastening of the sail at the wing tips as well as the correct positioning of the two pivoting sleeves (the two screws should be positioned directly in line with keel).
- Check the position of the battens and their fastening strings, check the condition of the luff lines and their fastening to the sail.
- Make sure no upper cable is looped around the king post and luff lines are correctly positioned into the groove of the fixing pulley.
- Check the thimbles and nicopress of the rear lower cables at the keel tip.
- Check the tensioning of the crossbar cables, the correct positioning of the pushpin and its safety, as well as the condition, and fastening of the strap holding the keel pocket.
- Slide your hand along all the lower cables to detect signs of wear.
- Check the connection of lower cables onto the A-frame , the condition of these cables and their nicopress, the pushpin of the control bar.
- Check the hanging system, the condition and positioning of the tensioning cables (make sure they are not crossed) and check their holding strap at the front of the king post.
- Check the hang point device condition on the trike (possible twist, cracks), the condition and position of the hanging device, its butterfly nut and its security ring.
- Check the connecting of the hang point trike safety cable. It must imperatively pass under the tensioning cables into the loop of the retaining strap, circle the king post and pass again inside the loop before fixing it onto the upper beam of the trike. This system ensures the fastening of the trike as well as tensioning of the crossbars in case of failure of one of the main components.

c) Flight specifications

WARNING:

**The wing has not been designed for aerobatic flying.
Flight envelope's respect is imperative**

- **Pitch attitudes limited to + or - 30°**
- **Roll banking limited to 60°**
- **No inverted flight**
- **V.N.E. (velocity never exceed) : 81 mph (130 km/h)**
- **Stalls authorized only in glide path with a progressive speed reduction and throttle to idle position.**

Over these limits, some stability problems, loss of control, structural failure or irreversible "tumbling" motions can occur.

Better handling will only be reached after about 10 flying hours and roll control will be more difficult during the first flights.

– **Control bar :**

Pushing the control bar forward causes the wing to pitch nose up ,which increases the angle of attack (the aircraft will climb) - primary effect, and a decrease in air speed- second effect.

Maneuvering the control bar laterally causes the trike to shift in the opposite direction of your movement, thus changing the center of gravity of the aircraft. It produces a roll movement in the direction of the trike displacement (control bar handed on the left, center of gravity moved on the right : .roll movement on the right)

– **Trim :**

The neutral position of the trim corresponds to the alignment of the mobile nicopress stop in the control window with the “O” of the scale. **This setting is recommended for take-off and landing maneuvers.** To increase the hand-off cruising speed, turn the control knob anti clockwise. You reach the maximum once the mark appears on top of the control window, facing the “rabbit”. Do not try to turn above this position or the control cable may turn in reverse direction. To decrease the cruise speed , turn the control knob clockwise. You reach the minimum once mark appears on bottom of the control window, facing the “tortoise”.

To counter ageing effects on the sail and the increase of the billow that decrease the trim efficiency, you can move the sheath end on the A-frame strut upwards in order to tense the cable. Just unscrew the tightening nut, choose your setting, place the nut back, and bring the exceeding piece of sheath into the empty part located between the top of the A-frame strut and the king post. Keep the same value as this one to move the cable-clamp set below the sheath stop upwards, in order to do not change the positioning of the mark within the window.

– **Short take-off and landing techniques :**

The minimum take-off roll distance is reached by increasing R.P.M. to full power with brake, and pushing the control bar fully forward. The control bar should be brought backwards immediately once the wheels are in the air to obtain a climbing speed ranging of 70 km/h (mph) according to the load. A short landing needs a slow approach speed ranging of 70 km/h (mph) and raise the nose a few meters before touching the ground, in order to touch the wheels at stalling speed. Brake and pull the control bar at its maximum in order to reach a better aerodynamic braking once the rear wheels have touched ground.

– **Behavior during stalling :**

The stalling point is reached more easily with a backward hang point position. Once the stall angle of attack is reached, the control bar starts pushing back forcefully. Avoiding any resistance to this tendency for a short while allows the wing to recover a correct speed. In that case, the loss of altitude will be less than 10 m. (33 ft) If the control bar stays pushed out despite the warning signs, the wing will stall and the loss of altitude may easily reach some 30 m (100 ft). An asymmetrical start on one wing is possible, particularly during the running in of the sail (first 50 flying hours). **To avoid tumbling risk, the stalling exercises must be imperatively carried out with engine at idle, with a very slow decrease in speed obtained by a progressive control bar pushing out.**

– **Banking :**

Banking of the wing has to go along with progressive pushing out of the control bar in order to ease the maneuver and to balance the banking. On the opposite, pull the control bar in, allows getting back faster in the horizontal line after banking. With a low cruise speed adjustment, it is necessary to increase the speed before the wing is put into banking to avoid stalling of the lower wing. An increase in engine power is also advised to maintain the flight level during the turn.

– **Behavior in strong wind :**

– *Once grounded and motionless*

Park the aircraft perpendicularly to the direction of the wind, with its windward wing lowered. Fix the A-frame on the front tube of the trike with the Velcro used for packing the battens of the sail and put chocks under the three wheels. Take the wing off the trike and put it flat on the ground windward, if the aircraft is not going to be used immediately.

– *Ground-runs :*

Keep the sail flat into a headwind. Push the control bar against the trike front strut with a tailwind. This will avoid flipping. Keep the wing horizontal with a side wind. It may be difficult to hold the A-frame in its position. Never let the wind lift the wing up.

– *Take-off and landing :*

As ground run distances are considerably reduced by strong wind, try to face the wind. If it is impossible, perform the take-off and landing maneuvers with greater speed than you would normally do, in order to diminish the drift angle and counter the effects of the gradient. Keep to the axis of the runway with the front wheel control without considering efforts on the sail.

– *Load effect - dynamic stability :*

An increase of the carrying load will require more effort for pitch and roll, and an increase in stall speed.

WARNING :

Do not fly without the nose bonnet. This streamlining has considerable effect over pitch and roll stability of the wing. Its lack alters the internal pressure of the sail, which may result in great modifications of the airfoil shape.

d) Adjustments

– Hang point position

Move the hang point piece along the keel to adjust the hang point position. The nylon locking rings must be fixed according to the chosen hanging point position (3 positions available). The hand-off cruising speed increase of about 5 km/h (3 mph) per centimeter when moving the hang point forward and vice versa. Each position may be used. It only changes the cruising speed, without any influence on stability and performances. **However, the hang point should never be placed to its most backward point on the keel if the total hanged load exceeds 772 lbs (350 kg).** The cruising speed would be then too close to the stalling speed of the wing and make pilotage difficult. During the first flights, it is better to leave the hang point position in its original adjustment, which has been chosen to take the aircraft easily in hand. This standard position corresponds to the second position, beginning from the front.

Warning : Any change in the hang point position means a variation of the A-frame angle and therefore a different tension of the lower longitudinal cables. Various adjustment holes are designed in the cable fixation rail at the nose of the wing, allowing them to keep a correct tension whichever hang point position chosen.

– Position of the pivot sleeves at the leading edges tips

The two bolts pivoting sleeves have been originally designed for the bolts fastening the sail to be in line with the keel. Their differential pivoting should only be used for rectifying a tendency to turn on one side. Once adjustment has been made, mark with a felt-tip pen the leading edge link with the sleeve or secure it with a pop rivet in order to find the correct position again at each assembling. If the wing pulls to the right, turn the left wing sleeve anticlockwise in order to increase the twist, and the right wing sleeve anticlockwise too, in order to decrease the twist. For a wing pulling to the left, turn the two sleeves in a clockwise direction. If the correction is insufficient for a perfect wing adjustment, use the tension of the sail as indicated in the next section.

– Sail tension

Modify the sail tension at the wing tip to counterweight the aging effects upon the sail. To perform this adjustment, remove the protecting cap from the wing tips and rotate the bolt placed at its end with a 10 mm wrench. Put the cap back and readjust if necessary the tension of the small ropes of the inner and upper surface last wing tip batten, because of the modifications of the sail position on the leading edges tubes. Tense with a maximum of 5 turns (5 mm) and control with a fly-test.

IV) Maintenance

– Assembling of the wing folded in 4.5 m

- In some cases of shipment, the wing can be folded in a length of 4.5 m, by removing the rear parts of the leading edges and by dismantling the control bar.
- For assembling proceed as follows:
- Unfold the ends of the sail.
- Slide the rear leading edges through the opening at the wing tip and fit them in the front parts.
- Then, finish sliding the rear leading edges. Turn slightly and push in order to line up the half-hole and the horizontal bolt "connecting" the crossbars on the front part of the leading edge. Make sure that the plastic lugs at the rear of the tubes are face-to-face.
- Insert the sleeves of the wing tips holding the sail into the rear leading edges.
- Fix the sail onto the sleeves with the 4 FHC bolts and the nylstop nuts. For this, while holding the extremity of the leading edge, pull the sail on one of the two leading edges with a string that goes through the grommet located at the extremity of the sail. Set the bolt corresponding to the internal grommet and the inner drilling of the wing tip sleeve. This process requires two persons. Make sure that the aluminum guide retainer, which adjusts the tensioning, faces the slot of the sleeve, at the tip of the leading edge.
- Set the outer bolt that fixes the sail after removing the string. Moderately tighten the nylstop nuts. Follow this procedure for the other leading edge.
- If you find it too difficult, first, remove the screws, which hold the sail on the leading edge at the nose level. This way, the sail will move back easily. Replace these screws once the wing is fully open and tensioned. Check the position of the fabric around the nose plates and the nose batten on the stop pin at the front of the keel while opening the sail.
- Position the wing tip sleeves by rotation and align the marks on the sleeves with the "0" showing on the scale located on the leading edge tube.
- Install the control bar on the revolving base fixed to the left A-frame strut with the 6mm CHC bolt, washers and nylstop nut. Close the leather protection up. Assemble the wing according to the normal procedure; check the sail fixations located at the end of the wing. Check the fixation of the control bar.

– **Transportation :**

Bumpy and long drives might damage the wing unless it is properly loaded. Transport the wing and the trike by road requires that the wing, in particular, is properly braced, cannot shake about and is generally very carefully loaded and tied down, so that no hard points can damage tubes and sail. We suggest carrying the wing carefully on a ladder covered with foam rubber to avoid precarious overhanging.

Do not tighten too much the wing with straps or rubber extensible springs in order to preserve the stiffening device of leading edges airfoil. Avoid any shock and bump.

– **Storage :**

Keep it in a dry place, protected against U-V rays.

Clean it with fresh water after exposing it to sea air. Wash out any grass stain with water and regular soap.

Open the cover to allow the sail and the structure to dry after transport or use in the rain.

– **Overhauling**

IMPORTANT

IN REGULAR CONDITIONS OF USE* A COMPLETE OVERHAUL OF THE WING IS ESSENTIAL EVERY 150 FLYING HOURS AND AFTER ANY HEAVY LANDING. THIS OVERHAUL INCLUDING COMPLETE SAIL AND STRUCTURE DISMANTLING, REPLACEMENT OF ALL SCREWS AND NUTS AND A SYSTEMATIC CONTROL, MUST BE CARRIED OUT IN OUR WORKSHOPS OR IN AN AUTHORIZED TECHNICAL STATION***. IT IS NECESSARY FOR SAFETY.**

* A special use (mountain, tropics, sea environments and rough fields) requires a superior frequency, i.e. every year and every 100 hours.

** Or at least every two years if the wing flies less than 150 hours.

*** Whose operators follow a specific technical training in our workshops.
An updated list is available on demand.

Ageing of the fabric and seams of the sails may cause an important reduction of the wing resistance. The degradation is principally caused through exposure to ultraviolet rays emitted by the sun and the moon. In order to slow down the process, the sail should be stored folded in its cover, or if it stays rigged, in closed premises. Always put it away in a sheltered place, shielded from the rays of the sun, even between flights. These measures help to lengthen sail life.

A strip fabric identical with the one used for the upper surface is stitched in the middle of the sail and above the keel pocket. The strip is made of two samples sewed together. During each periodical overhaul, part of the strip must be cut off, and submitted to a test of wear and tear in our premises. The results of the test determine when the replacement of the sail becomes essential for safety reasons.

Every 50 flying hours, check :

- The seams of the upper surface sail and the keel pocket in the center of the wing.
 - Possible tear of the sail and the rubber strap joining bottom and upper surfaces.
 - The maintaining strap of the tensioning cables in front of the king post and the one holding the keel pocket.
 - The correct condition of the ropes fixing the battens. Tighten them again if needed.
 - The tension of the ropes maintaining the last two battens situated at the tip of the sail should be very firm indeed.
 - Fastening bolts :
 - of the cables at the bottom of the A-frame
 - of the A-frame seating on the control bar
 - of the crossbar/leading edges link
 - of the tension device on the keel
 - of the hang point system
- Change them if they show any sign of wear or rust.
- The hanging device in order to detect any deformation of the plates, any crack.

In the event of heavy landing, check imperatively :

- The straightness of the leading edges (imperative dismantling of the rear parts).
- The condition of the internal stiffeners of the leading edge profile.
- The nose plate and its nuts.
- The hanging device (wear - cracks).
- The straightness of the keel.
- The lower cables.
- The fastening of the sail at the wing tips.
- The seams of the keel pocket on the sail.
- The crossbars and their link with the leading edges.
- The screws, the a-frame uprights.
- The tensioning device at the rear of the keel.
- The battens (airfoil symmetry).
- The fastening of the luff-lines on the sail.

WARNING:

Every "nylstop" screw must be replaced after each *dismantling* and always tightened with a special glue of the "LOCTITE" type.

**All repair work should be carried out in
our workshops or at an authorized
technical station***

* Whose operators follow yearly a specific technical training in our workshops.
An updated list is available on demand.

PERIODICAL OVERHAULS BOARD

Serial number:

Date	Hours flown	Company which has carried out the overhaul Address and stamp

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Notes

WING – QUALITY FORM

Anxious to ensure the perfection of our products, we have set a sequence of controls covering all the steps of production. We are working continuously on their improvement and we are in need of your help. Please return this reply form accurately filled if you find any mistake or problem concerning your trike, which could affect its quality or finish, even if it is a minor one.

Your name, address and telephone number :

Type : _____

Delivery date : _____

Wing serial number : _____

Colors of wing : _____

Distributor : _____

Hours flown : _____

Problems noticed : (explanations and / or drawing)

