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1. About This Manual

Most everything the pilot needs to know about the RIVAL S and X wings from Evolution Aircraft Inc. is contained within this manual. It is recommended that you thoroughly familiarize yourself with the entire manual before you use your new wing for the first time.

It is very important that you become familiar with the set-up procedure for the RIVAL S and X wings, or it is possible to damage them. Please take the time to look through the appropriate set-up sections before attempting assembly.

Most importantly, you are reminded that this manual is not intended as an instructional device on how to fly weight-shift control trikes. Rather, as the purchaser of this product, in the spirit of our self-regulated sport, you are responsible for bringing with you the expertise required to safely operate this vehicle. If your trike is a Light Sport aircraft you need the proper Light Sport documentation to fly your Trike legally. By purchasing or operating this product, you assume complete liability for its safe operation. Evolution Aircraft Inc. offers this owner's manual simply to assist you with the features particular to this model of trike wing regarding its unique assembly, flying characteristics, care and maintenance, and technical specifications.

For those looking to advance or refine their particular flying skills, consult the fine line of instructional books dedicated to knowledge and skill-building published by the FAA (Weight Shift Control Flying Handbook) or other Civil Aviation Authorities (CAA) around the world that have a weight-shift-control or flex-wing micro-light category, or the factory can recommend any number of professional flight training centers.

Please practice safe aviation!

2. About the RIVAL S Wing

The RIVAL S wing is 12.4 sq m and recommended for experienced pilots or pilots who were trained with the RIVAL S. This means a beginner or even high time pilots who were trained and soloed on a larger and or less responsive wings should not attempt to fly a RIVAL S wing without transition training. The RIVAL S **REQUIRES** all turns to be coordinated by pushing the bar forward after banking the wing. Flight schools around the world are using the RIVAL S wing to teach new students to fly a trike, and as a result many of those students are safely soloing with the RIVAL S wing and continuing to fly and own the RIVAL S as their first wing. Trike pilots should have an instructor's approval before flying a RIVAL S wing or a high degree of skill to transition to this wing. The RIVAL S wing has **very sensitive controls** and **WE RECOMMEND TRANSITION TRAINING**. Under all circumstances a pilot's first flight should be made in absolute calm winds avoiding any mid day convection if they are to try and transition themselves to fly this wing. Due to muscle memory, many high time trike pilots cannot resist over controlling this wing and will NEED, transition training. Small movements allow the wing to be flown with fingertip and hand movements as opposed to full arm movements when controlling the roll. The combination of precision handling, low sink rate, a docile stall, and excellent energy retention combined with a very wide speed range makes the RIVAL S one of the finest high performance, recreational trike flex-wings in the market today.

About the RIVAL X Wing

The RIVAL X wing is 14.0 sq m and recommended for beginner through advanced pilots. The RIVAL X is nearly identical to the RIVAL S with 2 feet of wing area added to the center of the wing and 7 degrees of fixed flaps making it an excellent short field version of the wing. The longer wing span also dampens the roll and makes the wing much harder to over control at any speed. The roll rate is still faster than most wings when the controls are applied forcefully and pushing out to coordinate most rapid turns is still required which may require some transition training for pilots that learned on other wings not requiring such an input after banking.

The RIVAL S and X wings achieves exceptional speed range and superb handling for many reasons. The sail and cut are composed of a carefully selected and applied field-proven synthesis of the latest materials that are matched to the leading edge curve. The sail features a leading edge pocket Internally, reinforced with a Mylar sheet insert. Drag is reduced with a pair of faired wing struts. Washout is controlled via large diameter, multi-sleeved leading edge tubes and a PX 10 band that runs span-wise on the top surface of the wing. The trailing edge is also reinforced with a PX sewn in strip. Traditional batten cords have been found to be the most reliable means of securing the battens. Airfoil shaped down tubes/uprights also cleans the form further. Vortex generators or rubber turbulators near the leading edge of the wing enhance slower speed control and decrease stall speed. Lastly this wing has been designed to fly 1160 pounds and handles optimally at this weight. When coupled to the REVO, best handling and stability will be achieved 2 up with the gross weight close to, or at, 1160 pounds.

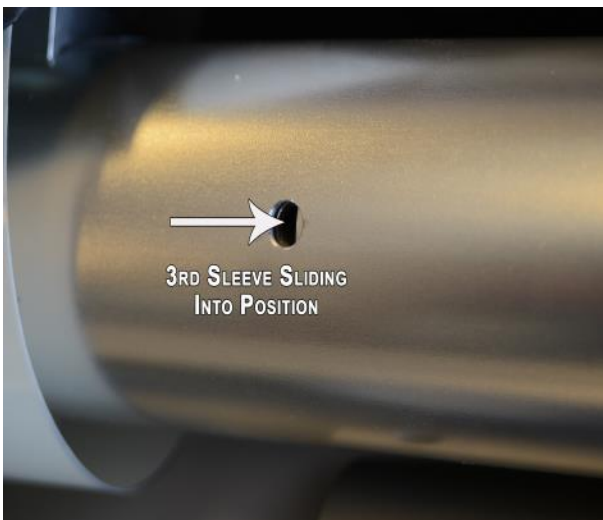
3. Re-Assembly from Shipping Crate (Short Pack)

Carefully undo the crate packing so as not to damage the wing inside. ie: Do not cut into the box. With the wing out of the box find the control bar, battens and outer leading edge tubing assemblies. Separate the **left** (red) and **right** (green) outer leading edge assemblies.

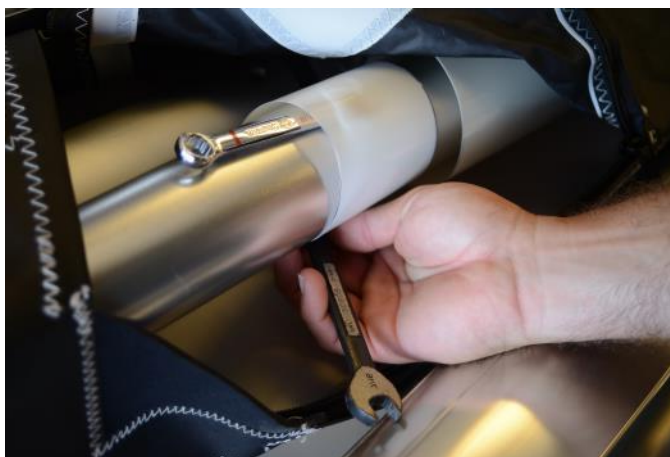
Place the wing on its back side so the down tubes/uprights are facing upwards. After removing the temporarily installed hardware from the leading edge connection and the rubber caps from the cross tube and leading edge, which is inside the fabric of the wing, put one of the removed rubber caps on the outboard leading edge to protect the sail as you slide it into place. Slide the outer leading edge tubing assemblies into the sail from the sail tip carefully and slowly. Note that the notched out end on the leading edge tubes is the side that slides into the existing leading edge tubing present inside the sail. Remove the rubber cap once the leading edge is in position. Slide the rear section of the leading edge into the front section until the hole lines up (see photos). Install bolt from the bottom up (remember the wing is inverted, *see photo below), wrap the mylar protector around the LE. After the bolt is through the leading edge put the hole in the mylar protector over the threaded bolt end and pull around and over the leading edge and bolt head and then back to the threaded end of the bolt with the other hole in the mylar protector. It does not matter which way the shield goes so long as the bolt head is shielded when finished. Now thread the nut on over the 2 ends of the mylar (top of the leading edge) and tighten snug. CAUTION: Do not over tighten or you may deform the tube.

WARNING: It is possible to put the bolt in with the leading edge slid out a few inches. Many people make this mistake because they see 2 tubes when they look through the hole. When in fact both tubes belong to the outboard leading edge and the inboard leading edge will slide between these tubes making all 3 holes per side line up. Failing to line up the hole will leave the leading edge approximately 1" too long and stretch the sail beyond its design and damage the sail. Furthermore the wing will be unsafe to fly in this configuration as the leading edge would then be allowed to rotate causing a long list of problems. PLEASE BE 100% SURE the leading edges are assembled properly before flying this wing.





Now install the large pivot bolt through the cross tube and channel bracket on the leading edge. Slide the cross tube onto the 3/8" bolt with the large Nylon washer between them. Note: the first side will be easy and the second side may require manipulation to line up the holes. To line up the second hole simply move the keel from side to side until the holes slide through. Follow the pictures in order. First is the white nylon washer (between the bracket and cross tube), then the plastic spacer, SS the Half moon fender washers, AN washer, then the castle nut and the safety pin. Note the safety pin so it slides in easily, then rotate the entire bolt 180 degrees to latch the safety pin.



IMPORTANT: this bolt needs to be tight enough that the cross tube cannot rock back and forth. Failure to do so will cause the wing struts to be able to change angle, which WILL cause a turn in flight.



4. Setup Procedure (Long Pack, Normal)

1. ASSEMBLE THE CONTROL FRAME or A-FRAME:

Place the wing on the ground. Unzip the cover bag if it is in the bag. Assemble the control frame (if assembling for the first time from a short pack the control bar needs to be installed). Check the lower cable rigging to ensure that it is not tangled kinked or wrapped inside the A-frame.

Caution: The down tubes can scratch the hang block when rotated into position if the hang block is not centered between them. Once in position no scratching can occur.

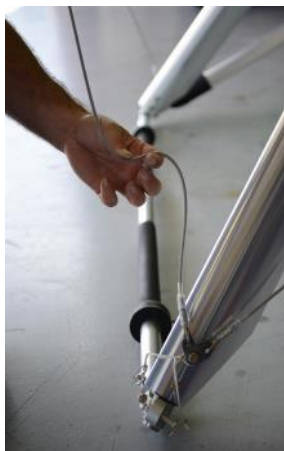
2. ROLL THE WING OVER

Stand wing on the control frame (do not attach the lower front control frame wires at this time). Note the assembled A Frame will try to fall over and turn 90 degrees to its proper orientation. Try to limit the amount of stress put on the upper down tube connection.



3. ATTACH THE FRONT FLYING WIRES

Ensure that all the lower rigging is untangled first. Then make sure the hang block is slid to the aft position on the keel. This will allow extra slack in the cables and make the swan catch easy to connect. Position the forged hoop into the swan catch; install the bolt, castle nut and safety pin.



3. SPREAD WINGS PARTIALLY

Carefully walk each wing out to 1/2 of it's own approximate flying position. This is the most convenient time to install the vortex generators by pushing them up through the grommets from inside the wing and then pulling them through from the top.

4. ATTACH WING STRUTS

Before attaching the struts, check to make sure the cotter pin inside the lower strut fitting is properly secured. This may be the last time it is visible for preflight inspection while the wing is assembled. You must rotate the fitting to reveal the cotter pin through the sight hole. Once the wing is assembled, the cotter pin may not be visible through the sight hole. See photo on next page.



Attach the upper strut fitting to the eyebolt FIRST. This eyebolt is located on the cross tube. It may be helpful to pull up some slack in the sail to have room to work inside connecting the strut. It may also help to rotate the strut and turn the eyebolt head once the pin is in to gain clearance for fingers to secure the safety ring. Once the upper struts are connected, the lower strut fittings can be connected. The front and rear cables will be extremely loose allowing the strut to be pulled several inches forward to the male fitting on the A frame. The angle of the rotating fitting must be rotated until they align. When done properly they will effortlessly slide together.



5. INSTALL THE YELLOW WING TIP STRAPS

Install the wingtip sail strap (yellow) over the end of the plastic tip cap. Note: **You MUST take the sail nose screws out of the metal grommet to make it possible to put the yellow webbing over the plastic tip cap.** Make sure that the webbing is in the 1" inch wide shallow slot in the plastic end cap. See picture. After the webbing is over tip run a string from grommet to grommet and around the nose plate and tighten the line to create tension in the sails leading edge. You may skip this step, but the yellow strap may fall back off before opening the wing. Secure the white Velcro tabs around the leading edge.



Note: After the wing is completely set up with exception of the nose battens being removed you can reinstall the sail nose screws. These screws stop the nose battens from coming off their perches during flight and also keep the wing sail secured at the tips when folded. It is only during the initial build that the yellow straps can fall off when the wing is folded.

6. POSITION WING ON ITS NOSE

Open the wing and place on its nose. Be sure that the yellow webbing does not fall off in the process. The white Velcro straps that loop around the leading edge are all that is holding the yellow webbing on until the wing is open if you did not use the temporary string though the metal grommets. Once the nose screws are installed (last step) the wing can be opened and closed without the chance of the yellow webbing falling off. NOTE: the nose screws will not line back up to re-secure the sail until the wing is completely built.

In order to get the wing on its nose, it is best to have 3 people. One on each wing tip to lift up to head height, and one on the nose. The 2 people on the tips should lift the wing and spread it open while watching the yellow tip straps to ensure they are not twisted, fully seated and not falling off. Once the wing is spread open with the tips at eye level the yellow straps will be snug, the wing will be nearly balanced and the person standing at the nose can take the wing and slowly lower it to the ground. Once the wing is installed on the REVO we do not recommend removing the wing for transport. Beyond the initial build, there should never be a need for assistance to fold and transport the wing. Set up and break down of the RIVAL S wing on the REVO is a 1 person job even if you remove the wing from the REVO, so long as there is no need to short pack the wing again.



7. INSERT ALL UPPER BATTENS

Install all of the upper battens; battens with white front ends on the right side, black on the left. Insert the battens from root to tip with gentle pressure, moving the sail's trailing edge up or down as necessary to help the front of the battens up over the cross tube and leading edge. Battens 12 and 13 may get stuck. **DO NOT FORCE or you can tear the batten pocket (sail).** Pushing the cross tube down at the hinge joint (unzip zipper and push down with your foot) may allow the batten to slide in easily. If it doesn't, find the tip of the batten by feeling inside the wing with your hand and lift it from inside the wing up and over the cross tube to help it slide all of the way in. The wing can be tilted to allow the leading edge to lay flat on the floor to be able to easily access all of the batten pockets. An alternative set up method would be to install the wing on the trike with a short bungee loosely securing the haul back cable to the latch before installing the battens. Failure to temporarily secure the haul back if the wing does not remain on its nose can result in the wing to collapse. **Secure all batten strings before tensioning the sail.**

8. HOOK UP the haul back cable

If using the first method with the wing on its nose, use a step ladder placed inside the A frame to reach the haul back cable. Remember, once the wing is on the REVO the wing will be level when you haul it back to fold and unfold the wing and no ladder will be needed. Pull the cable all the way back, until you can latch the cable shackle into the spring catch. Make sure the wing tip yellow webbing is completely in the 1" slot on the wing tip cap before tightening the wing with the haul-back cable.



7. LOCATE SPROGS INTO POSITION

Rotate the four sprogs out to center of the transversal batten. Now put the Velcro loop around the end of the sprogs. Leave Velcro loops slightly loose (approximately 1/2" gap). Not having the lower battens in will allow you to reach into the sail to get to the sprogs. If you cannot reach the inboard sprog, go in through the strut zipper and swing the sprog out as far as possible, then pull it out from the trailing edge while lifting up on the trailing to get the sprog under the transverse batten.



8. UNDER SURFACE BATTENS

Install the under surface battens from longest to shortest. Make sure the back ends are inserted back into the slot at the rear. The spoon shape should be “spoon up” or convex side down. **NOTE:** The 3rd longest set of battens have 2 sets (4 battens) of equal length. It is important to realize that one set is ½” thick and the other set is 3/8” thick. These battens can accidentally fit into the wrong batten pockets since they are the same length. The ½” battens start at the root and there are 3 per side, then the 3/8” battens start at the 100% double surface section of the sail and go all the way to the tip.

9. TIP BATTENS

The sprogs **MUST** be in place to make tip batten tension adjustments. Failure to do so will give a false tension and cause the struts to be adjusted too short. Install the upper tip battens in the upper leading edge hook. Fold the tip batten by pulling back the spring loaded slide by compressing the spring and hinging the strut. The open end of the strut goes on the top hook and the plastic fitting goes inside the pocket sewn into the corner of the upper surface. The tension of these tip battens is fairly critical for tuning purposes. They should be just snug when straitened. The undersurface tip battens slide into the open pocket sewn into the undersurface fabric and then slid onto the leading edge hook. The back of the lower tip batten with the bungee cord loop. Secure all bungee cord loops at this time. This includes the tip battens and the 100% double surface sections of the wing a that has provided bungees. **NOTE:** Be sure to place the lower tip batten **BETWEEN** the bungees spanning from upper to lower surface, then pull the bungee on the top of the upper surface to the batten tip and pull the bungee below the bottom surface to the same batten tip. When done properly this closes the trailing edge together with no gap. The bungees will hold the undersurface sail tension as well as hold the upper and lower surfaces together.



The wing is now ready to install on the trike carriage. Simply drive the trike carriage nose wheel over the control bar with the mast down (see REVO POH manual) and then lift the nose of the wing until the hang block hole lines up with the mast's hang bolt hole. The hang bolt must go through the rear hole of the hang block. Once the wing is connected to the REVO, allow the trike base to roll backwards over the control bar again and the keel will meet the back side of the mast. This will in effect lock the wing in a position to lift it as well as stabilize the wing and allow the front of the nose area to be within an easy reach.



NOTE: If your wing is equipped with the optional electric trim system. This is a good time while the center battens are out to install the linear actuator. The linear actuator is secured at the top nose channel bracket with a 1/4" Clevis pin and safety ring as shown in the pictures below. On the top of the keel tube of the wing near the nose where the linear actuator will sit, the keel is protected by a strip of sticky industrial Velcro (soft side).



POSITION THE NOSE BATTEN AND NOSE CONE

Put the nose ribs on the 1/4" stud located front top of keel tube. With the nose cone in hand start with the two top Velcro tabs and gently pull the nose cone down and around the nose plate to connect the two bottom Velcro tabs on the nose cone to its corresponding Velcro sewn on the under surface below the keel. **CAUTION:** the nose cone is required for flying the RIVAL S



11. CHECK AND CONNECT THE ELECTRIC TRIM SYSTEM IF APPLICABLE

The electric trim system consists of a linear electrical actuator with a 4 inch stroke, (3" on earlier models) that sits above the top nose plate. It connects its stroke arm to a machined cylindrical fitting using a 1/4" pin. This fitting is tapped to accept threaded 1/4" x 28 male studs with crimped on cable assembly that run to the "slider plate" directly behind the hang block via (6) AN-4 nuts. It is critical that the trim cables are properly routed. The correct routing of the cables is through the cross tube strap (thin black strap) and outside the keel strap (thick white strap). The linear actuator can be removed easily by removing the two pins and undoing the electrical connector. The non lock nuts are used in front and behind the slider plates and then tightened against the plates by using 2 wrenches after proper length has been established. The slider plates should be just or almost touching the aft limit stop bolt that is in the keel when the trim motor is in full slow (completely extended). You can leave approximately 1/8" gap to allow for stretch in the system. Once the nuts are tight hold the nut in front of the slider plate and thread on a locking nut to the trim cable. **WARNING: Removal of the linear actuator is necessary for folding the wing** whether attached to the trike carriage or off the trike carriage or for bagging the wing in its bag. Otherwise the cross tube hinge will impact the linear actuator when the wing is folded and **cause damage**. Also note that after removing the linear actuator from the wing, the cylindrical barrel that is attached to the cables should be routed through the cross-tube hinge cover assembly that has a black strap loosely tying the cross-tube to the keel. If this is not done you will feel some resistance to folding the wing back. Do not force anything. Take the time to figure things out and where the hang up is coming from if resistance is felt. If something seems to be



binding and you cannot locate the problem, be patient and ask for support from the dealer or factory.

WARNING: The electric trim linear actuator **MUST** be removed when folding the wing. This is done by taking the pin out of the actuator's main body, removing the machined round cylindrical barrel that has two cables screwed into it and unplugging the electric. There are no short cuts around this step without causing damage.

CAUTION: Make sure all zippers are closed after you pre-flight your wing and before you fly.

5. Preflight Procedure

A thorough preflight procedure is mandatory with all aircraft. The best technique is a circular walk around. Start at one location, the nose, and check each assembly point available for inspection.

- Sight along both leading edges, checking for similar curves.
- Walk towards the tip, feeling for dents in the leading edge tube.
- Pause at the wing bolts and look into the sail through the zipper inspection access. Check side struts fittings and safety rings.
- Continue to the tip and check the sail tip area for proper seating on the leading edge tube, and sail integrity.
- Verify that the sprog tubes are positioned correctly and Velcro straps are in place.
- Insure that the tip battens are properly seated on the leading edge hooks, and that the tension is set just snug.
- Walk to the keel, checking each of the battens to ensure that they are properly secured.
- Check the haul back cable catch connection.
- Repeat first half inspection as you work your way back around the nose.
- Check the swan catch at the nose.
- Check the nose cone for secure attachment.
- Check all the lower cable rigging for proper routing about the control frame.
- Check that the control frame uprights are straight and that the set up bolt is correctly assembled with castle nut and safety ring through the base bar and forked end fitting
- Check the cross tube center bolt/plates to insure that they are properly attached.
- Check the hang block and all bolts in the block.
- Make sure you zip up the center zipper after inspection. Flying the wing with the center zipper open (or any zipper) will result in loss of lift and pitch stability and cause dangerous flight handling!!
- Generally site the entire wing for symmetry. If you see something that does not look “right”, stop and investigate.

6. Fold Down Procedure

It is very important to note that the RIVAL S wing does NOT fold all of the way back (wing tips together) with its wing struts attached. The wing may be folded and trailered, but the tips will remain no less than 4 feet apart. This wing is designed to work with the REVO trike dolly for transport in an enclosed trailer. The wing can be folded all of the way back to put in its bag once the wing struts are removed after removing the wing from the trike carriage. Always fold the wings together symmetrically, bringing both leading edges back together at the same time. An alternative

to having someone help bringing in both leading edges at once, is to bring in one a bit, then the other a bit more, in three to four incremental steps. If you find resistance folding in the wings, check that the haul back cable is free to run forward through the cable hole center of the sail.

To fold the wing back by yourself with the REVO on its trike dolly, once it is time to fold the wing back, (see photo on next page) simply attach a 20' rope or tie down strap to the wing tip strap handles, and pull the wing tips back by walking backwards away from the back of the trike with both ropes in one hand. The wing is very level in this position so the wing tips will tend to stay where you leave them

WARNING: Do not fold the wing with optional electric trim linear actuator attached above the keel tube. This can cause damage.

WARNING: Do NOT attempt to fold the wing tips all the way together with the wing struts still installed.

To fold down your RIVAL S wing, just follow the reverse set up procedure steps as described in the previous section. Included below are a few guidelines to follow which will save you time and prevent wear areas on your sail. So tip battens are removed first, then the sprogs, next comes the undersurface battens, and then the haul back etc.

•REMOVE LINEAR ACTUATOR

- 1) Take the Dacron nose cone off and open the bottom zipper.
- 2) Pull up the nose battens from their perches on top of the nose plate and take them out towards the front. This should make it easy to put your hands in through the front and from the bottom
- 3) Put your hands in and take the safety ring off for the linear actuator Clevis pin attaching it to the top nose channel and on the cylindrical fitting (attached to cables) in front part of linear actuator (movable shaft side)
- 4) Disconnect the linear actuator electrical connection and pull the linear actuator out of the wing leaving the cables with the machined cylindrical barrel inside
- 5) Take the machined cylindrical barrel and cables and guide them “back” through the black loop that keeps the cross-tube hinge and wing keel tube together. To do this you may have to gently lift the cross-tube hinge up by hand just a bit and slide the cables back. See pictures on

•FOLDING THE SAIL Once the frame is folded with all of the battens out the wing sail will naturally fall between the keel and the leading edges. The sail must be pulled up and routed outside of the leading edges so that there is little fabric between the leading edges and the keel. Once the sail is pulled to the outside of the wing, the sail can be rolled up tightly and then tucked inside the leading edge. The important thing is to get the sail neatly stowed inside the leading edge pocket as shown in the photo below.



REVO dolly cart shown

- ATTACHING SAIL TIES** Fasten the first tie just aft of the rear cable. By keeping the keel tube outside of the tie, it will make it easier to organize the control bar in this area after the wing is flipped over. The forward tie is located splitting the distance between the control frame apex and nose plate. Pull the leading edge pocket up over the top of the wing so the top of the LE Mylar pocket is touching and/or overlapped. The third sail tie goes about 2 feet inboard from the leading edge tips.

7. About Operating RIVAL S/X Wing

Taxiing the RIVAL S and RIVAL X with the the wing level (control bar straight) while in a crosswind will require excessive strength. Most trike wings require the upwind wingtip to be lowered, however due to the high amount of anhedral designed into the RIVAL S, and X it requires the up wind wing to be held close to parallel to the horizon (still slightly down). This will appear to look as if the wing is being banked AWAY from the wind contrary to the technique used with most other wings. On takeoff the wing should be banked in this attitude and be leveled just before the bar is pushed forward to lift off. Using this technique will eliminate any additional workload on the ground while taxiing in the wind. Once the trike lifts off the ground the force required on the control bar will be eliminated entirely and only minimal control force will be needed to bank the wing.

The RIVAL S wing flies between 55 and 100 MPH hands off trim with the optional electric trim and the RIVAL X flies 50-87 MPH with the optional electric trim. This is where the trim limits are set on the keel. Adjust the trike on the keel to fly the speed of your choosing. It is recommended that you trim the wing between 60-75 MPH if you are using a fixed hang point. In order to use a fixed hang point (no electric trim) a collar is clamped aft of the hang block to stop the hang block from sliding back beyond this point. There is no need to put a collar in front of the hang block as it will slide back to the clamp collar in flight and remain there. A good starting point on the keel will be 75% back between the fast and slow stops. Due to variations in tuning there is no exact hang point for a particular speed. At gross load the RIVAL S/X may stall at slightly higher than published speeds based on the tuning of the wing (looser than middle hole on hall back adjustment or less than 3/8" shims in both wings, looser batten tension than factory set).

The takeoff ground roll on pavement for the RIVAL S/X wing varies greatly based on many factors such as weight, HP, atmospheric conditions and tuning. (see the REVO POH for performance figures on the REVO carriage). Taking off in grass, downwind, uphill, or with a crosswind especially coming from over tree tops will further increase the takeoff distance well beyond many pilot's guestimates, so be sure you have more than enough runway. It is important to get to a safe climb out speed before leaving ground effect which is around a bar position no less than 9" from full bar forward. For REVO and REVOLT trike carriages please see the REVO or REVOLT POH. It is advised that as speed builds up the pilot leans forward out of the seat with their back straight in order to keep a bend in his/her arms (no locked elbows). Push the bar forward ALL of the way to touch the compression strut of the trike carriage if equipped with one PRIOR to lift off speed and then wait for the nose to lift as speed increases. As the nose wheel lifts, pull back and relax the control bar to a position of no less than 9" from the compression strut ideally before the trike reaches 24" from the ground. Never leave ground effect with the control bar at or less than 9" from the compression strut. These high angle of attack maneuvers are safe at or below 24" and above 1000' AGL giving the pilot enough time to recover from an inadvertent stall. Stalling the RIVAL S/X wings at or below 12" should provide a very soft landing. Stalling from 24" should be avoided, but will not cause damage unless the bar is pulled in during the stall.

WARNING: Leaving the bar pushed out after the trike takes off can cause a possible stall.

Please note RIVAL S wings manufactured before July 2014 did NOT include an extra set of NOVICE #1 battens. These wings came standard with the advanced #1 battens only which were NOT labeled. Please contact Evolution Aircraft Inc. to order a pair of novice battens if desired.

Roll control on the RIVAL S wing should be done with extremely small horizontal bar movement when not using the special NOVICE battens in the #1 batten pocket. We recommend flying the RIVAL S with the novice #1 battens in place even if you are not a novice until familiar with the flying characteristics of the RIVAL S. When using the ADVANCED #1 battens we recommend holding pressure to turn. This works much more precisely than "bumping" the controls from side to side. It is very common for even advanced pilots to over control The RIVAL S during the first

minutes of flight on the new wing. We suggest flying the RIVAL S in calm conditions and making an effort to move the control bar no more than 1" from side to side until the pilot has the feel of the wing and is comfortable with the responsiveness. If able to get transition training from an experienced instructor we highly recommend it. The controls are not difficult to use in the advanced mode as much as they are extremely light and responsive compared to the vast majority of trike wings on the market today. Flying in the advanced mode simply allows movements to be small enough and light enough to reduce fatigue so long as the pilot does not over-control the wing which creates perpetual effort to continue flight. Moving the bar 1" and holding pressure for 4 seconds works much better than moving the bar 4" for 1 second. The RIVAL S will want to continue rolling in the direction the pilot initiated the bank. Once the trike rolls to the desired bank angle **PUSH THE BAR STRAIGHT FORWARD**. This will **coordinate the turn** and stop the trike from continuing to roll into the turn. If the bar is pushed forward too abruptly, the trike will start leveling back out. Pilots that give opposite roll input (move the control bar to the right to stop the trike from banking too steeply to the right) will cause the wing to Dutch roll which will cause additional control force needed on the control bar. This technique is highly inefficient and will cause the RIVAL S to slip sideways through the air. Understanding how to coordinate turns with the RIVAL S is one of the keys to mastering this wings capabilities. As your skills with the RIVAL S advance you can make fast turns using the "J" maneuver and experience over 75 degrees of roll rate per second. This technique should be learned from an experienced instructor. The RIVAL S has the capability to radically bank faster than most trike pilots will ever want, small soft inputs result in smooth controlled turns. Radical jerks to the control bar will result in radical bank angles. However fast roll rate is one reason the RIVAL S can be flown quite effortlessly in high turbulence with minimal effort.

The RIVAL X can be flown with much larger side to side bar movements and will tend to stop rolling as soon as bar pressure is released. When rolling quickly it is necessary to push the bar forward to coordinate the turn. Slow banks will tend not to require such coordinating of the turn.

The safe operation of this or any trike wing ultimately rests with the pilot in command. Because the responsibility of flying and maintaining the wing rests entirely with you, the risk of damage or injury you may cause to others and to yourself also rests entirely with you. We believe that in order to safely participate and practice the sport of flying, you must maturely accept responsibility for yourself and others. We recommend to fly conservatively, and avail yourself of all safety equipment (i.e.; parachute, strobes, etc.) appropriate to the conditions and terrain you fly in.

No wing on the market is totally infallible. It is entirely possible to push any aircraft beyond its limitations and damage or even break a wing. Very strong weather conditions may also cause structural failure.

WARNING: Aerobatic maneuvers, pitch angles beyond 30 degrees nose up or down, bank angles exceeding 60 degrees, aggressive stalls, and spins are maneuvers that should never be attempted under any circumstance.

WARNING: Do not exceed (86 MPH RIVAL S) and (74 MPH on the RIVAL X) In rough air or make large or fast control bar movements above these speeds. If you encounter turbulence at high speed, lift off the throttle immediately, then reduce airspeed by pushing the bar forward and then relieve the bar pressure by adjusting the electric trim if equipped.

WARNING:

RIVAL S V_{ne} NEVER EXCEED SPEED 115 MPH

RIVAL X V_{ne} NEVER EXCEED SPEED 105 MPH

RIVAL S V_a MAXIMUM MANEUVERING SPEED 86MPH

RIVAL X V_a MAXIMUM MANEUVERING SPEED 74MPH

Structural damage is possible if these limitations are exceeded. Respect these limitations.

8. Flight Limitations

Operations and limitation for the RIVAL S/X wing on the Light Sport Aircraft such as the Revo or REVOLT is available in the POH manual. The wing performance placard bearing test flight information and operating limits is located on the wing's left cross tubes. Special care should be taken to note the operating limitations, which are clearly stated on the flight operation placard. As with any wing, special care should be taken to note the operating limitations, which have been ascertained by careful testing. Flight operations should not exceed those laid down in the operating limits specified within this manual. No wing is totally infallible; there are inherent risks involved in flying a trike wing. It is quite possible to fly the RIVAL S wing beyond its operating limits using deliberate flying skills.

The responsibility for safety rests ultimately with the pilot alone who must decide whether the wing they are about to fly has been properly maintained, and is in air worthy condition.

•**FLIGHT OPERATIONS:** Should be limited to non-aerobatics maneuvers -- those in which the pitch angle will not exceed either 30 degrees nose up or nose down of the horizon and in which the bank will not exceed 60 degrees.

•**WARNING:** The owner and operator must understand that due to the inherent risk involved in flying such a unique vehicle, no warranty is made or implied of any kind against accidents, bodily injury, or death. Operations such as aerobatics maneuvers or erratic pilot technique may

ultimately produce equipment failure and are strongly discouraged.

•**NEVER FLY FASTER THAN VNE:** To verify the speeds you are achieving, you should fly with an accurate airspeed indicator. During certification testing, test pilots found that it would be possible to exceed VNE during smooth acceleration. The most typical cause of exceeding VNE is rapid acceleration performing aerobatics maneuvers and steep spiral dives.

9. Wing Tuning

When a wing is new and from time to time it may be necessary to tune the wing to get rid of small turns etc. Flex-wings unlike rigid wings stretch over time or with load and this can happen unevenly over time and turns can develop. When folding, packing the wing, the operator should note how things were so when the wing is unfolded to get it in its flying format, all things are roughly put back in the same scheme as before. Thus it is invaluable for the operator to take some pictures of different areas at some point when the wing is flying well and keep them handy in case the operator needs to refer back to these pictures for anything.

Tuning of the wing should be done in calm conditions and only one thing should be changed, logged and a test flight be performed to note its proper effect. This section is by no means a complete guide on tuning. The idea is to give guidance on the most basic tuning for the most common problems. If the wing develops a severe turn all of a sudden or is divergent, the operator needs to think about what happened or changed last? If there was a hard landing or crash, was there a thorough inspection done of the tubing for straightness? What about a sail inspection? After a crash, the sail of the wing could stretch so unevenly that it may not be possible to bring the wing back in tune easily at all without changing to a new sail or getting it back to the manufacturer for testing and tuning.

If any adjustments are made on your wing, we recommend that they be noted in your Maintenance Log or aircraft logbook. It is then easy to go back and trace occasional problems. Please bear in mind that certain adjustments, like the cross tube sweep setting, are very critical and often create trade-offs in handling, performance, or --more seriously-- safety.

Never make more than one change at a time.

This is a basic rule in test flying, which allows you to keep track of the progress made.

Trouble shooting: the most common need for tuning is from a turn. It is advised that if a turn develops that you trace back ANY asymmetry that was previously done for tuning purposes. There is nothing worse than tuning a wing that is already tuned and the second tuning job is done to compensate for the first tuning. Instead, it is usually best to set the wing back to stock. In order to do this there are several things that must be checked:

- 1) battens are set to the batten chart
- 2) leading edge shims are equal (3/8 shims are standard and recommended on both sides)
- 3) tip twist. The Factory setting is 40 degrees relative to the keel
- 4) inboard sprog angle is 10 degrees relative to the keel
- 5) outboard sprog angle is 20 degrees to the keel
- 6) webbing straps or internal bridging fully lapped Velcro
- 7) keel strap fully lapped Velcro
- 8) batten string tension snug and consistent, especially on both sides of wing
- 9) trim tab on wheel pant straight

Turn in Wing

Many factors such as asymmetrical wheel pants or asymmetrical windscreen from poor mounting or a twisted mast from wear and tear or a leading edge strike can cause the trike to have a turn. The thrust line can be mis-adjusted as well causing an unwanted turn in flight. The wing may not be the source of the problem. It is always best to fix the source of the problem and not tune the wing to fix the problem if the source of the problem is not in the wing. Having said that, it may be difficult for an end user to find the source of the problem. If the trike has been rebuilt, had a roll over or the control bar does not appear to be straight (perpendicular to the main trike carriage keel) these factors should be considered before making adjustments to the wing.

When making adjustments, if there is no result from the tuning, DO NOT leave the adjustment in the wing if it is different than the factory setting. Return the wing to the factory setting when no result is achieved from making a change.

- 1) We have found the most effective way to tune out a turn specifically on a RIVAL S wing is to open the webbing strap at the upper wing strut connection point zipper by $\frac{1}{2}$ " at a time with a maximum of 2" of Velcro showing from fully lapped (closed). Although this is very effective the next webbing strap in towards the root can be opened in the same manner. The wing that raises during flight is the side you open the webbing strap on. This may seem contradictory to what might be expected from this adjustment. Again this is a specific result to the RIVAL S. For the RIVAL X batten tension is the best way to tune for a turn. Tighten the string tension on the low wing all the way down the wing or loosen the strigns on the high wing. It is advised to seach for the tightest strings on the high wing and loosen them first and find the loosest strings on the low wing and tighten them first.
- 2) If step 1 does not eliminate the turn entirely, we suggest the trim tab on the REVO be adjusted. To eliminate a left turn, bend the trim tab out on the left wheel pant. This will work especially well for a high speed left turn. If the REVO is equipped with an electric roll trim option simply press and hold the trim until the trim tab eliminates the turn during flight. For REVOLT trikes batten 5&6 can have the camber increased on the low wing and 5&6 camber decreased on the high wing. It is recommended that the front curve match the batten template and then the straight "tail" of the batten stray away and end up either up to 2" above or below the end of the batten end point on the template.
- 3) As a last resource, adding reflex to the descending wing can also be done. When adding camber only battens 5&6 should be adjusted as they have little effect on the pitch stability of the wing. However we have found best handling to come from a symmetrical airfoil. Please consult the manufacturer before bending battens as this can make the wing unsafe to fly in some cases if the battens are bent too much. A good rule of thumb is NOT to raise the high point of the camber more than $\frac{3}{4}$ " and if reflexing the batten, not to make the tail of the batten 1" higher than the standard profile on the batten chart. If the terms above are unfamiliar or unclear DO NOT attempt to alter the batten profile yourself. Find someone with experience to help.

4) Although we have found twisting the tip caps or lengthening or shortening the tip cap out with different sized shims to be ineffective, there are always exceptions where this may be needed. However we recommend you contact Evolution Aircraft Inc. if you have not resolved an unwanted turn by step #4

* To modify leading edge tension, slip the tip webbing off the plastic end cap and slide the sail forward. You will need to remove the leading edge screws under the nose cone and fold the wing slightly with the battens removed to get the yellow strap off. You will see that between the plastic end cap and the leading edge tube there is a piece of tubing cut to 1/8" up to 1/2" long, these are shims. These are what change the LE tension. TO remove the end cap, back out BOTH Phillips head screws 3/8" then hit the screw driver in to make the screws go flush. Hitting one screw should make both go flush. **DO NOT ATTEMPT THIS WITH ONE SCREW STILL TIGHT.** The plastic end cap can now rotate freely and be pulled out to swap shims. Replace the plastic end cap and the yellow tip webbing. Remember the angle of the tip cap must be re set before tightening the 2 screws back up. There are marks on the leading edge or use a protractor to set them at 40 degrees to the keel.



NOTE: Make sure to mark the stock 40 degree position on the metal leading edge. And also mark where the rotation was before it was removed so it can be set back to where it was. The rotation of these caps is very important!

The Wing Flies Too Slow

- 1) If equipped with electric trim ensure the trim system is operating to full fast position with the front of the HB touching the forward limit through bolt in the keel. If collars are used for a fixed trim speed setting, move the collars forward ½” at a time.
- 2) Tighten the haul back cable. There are 3 holes to choose from for the adjustment pin which is under the neoprene cover near the haul back handle. Simply unhook the haul back, adjust the cable length, and retention the wing.
- 3) Loosen the internal webbing straps 1” at the wing strut zipper on both sides. Possibly loosen up the next inboard webbing strap up 1” if needed. These webbing straps very much control the speed of the RIVAL S as well as having the ability to induce a turn.
- 4) Loosen the keel strap. Loosen it ½” at a time not to exceed 1” of unlapped Velcro
- 5) Twist the tip caps down (increase the AOA) adjust these in small increments of 5 degrees. Do not twist below 30 degrees relative to the keel.

The Wing is Divergent (flies with unlimited or increasing speed)

- 1) Tighten all webbing straps to fully lapped (stock setting)
- 2) Loosen the haul back cable
- 3) Tighten keel strap to fully lapped (stock setting)
- 4) Twist tips up to 40 degrees relative to the keel (stock setting)
- 5) Reflex battens 13 and possibly batten 12 and 11 as well. This step should not be needed but will effectively increase the pitch stability of the RIVAL S Contact Evolution Aircraft if you need further detail

10. Transportation and Storage

The RIVAL S/X wing bag is NOT waterproof. We do offer a waterproof bag that goes on the outside of the standard wing bag. Avoid hard spots pressing on the wing during transportation or storage and have as many supports as possible; we recommend using a well padded three-point support system, with less than four feet of unsupported wing extending off either end. Use flat tie down straps, at least 1” width rather than elastic or rope to secure the wing, and tie both ends of the wing to a support or down to the ends of the vehicle in order to prevent the wing from flexing. Take care to not over tighten the wing tie-downs, as this can crimp your Mylar leading edges. A good technique is to squeeze and compress the wing’s Mylar, sail, and leading edges into a snug bundle as it gets tied down, rather than using the wing tie-downs to compress the wing within the bag. It is preferable to keep the wing dry. Definitely ensure that it is dry before storing for longer than just overnight. Any contact with salt water, of course, requires immediate rinsing with fresh water to prevent corrosion to hardware, rigging and tubes.

We highly recommend using the REVO trike dolly on REVOs to transport the RIVAL S/X wings on the trike in an enclosed trailer. Instructions for using the Dolly and folding the wing on the trike can be found in the Dolly manual. Also the www.evolutiontrikes.com website provides videos on the wing page for transport with the dolly.

11. Regular Maintenance Schedule

The RIVAL S/X wings will require very little in the way of maintenance if you care for it properly in your day-to-day use. Following are some general points to follow in maintaining your new wing which will help ensure the safety of your flying and the performance retention of your wing; we suggest you follow this maintenance schedule faithfully -- your ongoing care will pay off in the future. A note on use of silicone spray: This lubricant is useful in that it can minimize friction on zipper pulls. Care must be exhibited, however, in that if you do not wipe off excessive silicon application, the fluid will act essentially as a dust and dirt magnet. Due in particular to the problems associated with silicon attracting foreign material, we recommend against the practice of using silicon on your wing's battens. Clean, dry battens all by themselves are the best ways to prolong the life of the high wear area of the sail batten pockets. Probably the best way to prolong those batten pockets under adverse conditions is to wipe off the battens with a clean dry cloth prior to each insertion.

12. Sail Maintenance

If you must wash the sail, wash it with a light detergent only. Better still; wipe the sail down frequently with a soft, damp cloth keeping detergent washing to a minimum.

Because of the acids in their system bug grime should be cleaned immediately to prevent long- term deterioration of the sail.

To renew the luster of Dacron, you can use the product called "Sail Bright" available from marine hardware stores. Use as directed.

Apply sail repair tape to small (less than 1") holes in sail. This will prevent fraying on the edges where the opening is located. Any small rips located at stress points (i.e. the trailing edge or critical seams) should be professionally repaired to insure that the structural integrity of the unit is not compromised. Any rip in the trailing edge seam area is cause for grounding the wing until repaired.

CAUTION: Sun and weather cause more deterioration than hours of flying. Keep your wing covered when not in use. Wing covers are available.

13. Monthly Inspection

- Check Nose battens against the airfoil maintenance blueprint if any turns or undesirable handling characteristics develop.

- Inspect all batten tensioning cords
- Lubricate the zippers on the sail and cover bag.

14. Twice Yearly Inspection

- Remove the cross tube center junction scuff pad to inspect all cross tube support cable components: tangs, pins, nuts, bolts, cross tube and cable itself. Tighten nuts if loose.
- Check all tubing, especially the control bar frame, for possible damage, which could occur during, set up, fold down, or transportation.
- Closely inspect the sail mounting grommets and webbing at the tips.
- Inspect the sprog cable for wear and/or undue stretch.
- Inspect all rigging and components. Replace any worn, bent or corroded bolts or locknuts connecting two moving parts together: cross tube plate junction bolt, cross tube clamp bolt, etc.
- A professional sail maker should mend critical sail tears.

15. Annual Inspection

The only way to thoroughly and completely inspect all of the components of your wing is to completely remove the sail from the frame, to allow visual and physical access to everything. Even if yours is the best-kept RIVAL S wing, you should have the sail removed for a complete inspection at least once every three (3) years or 500 hours whichever comes first and then every 250 hours or 2 years thereafter. This should be done by an authorized service center or a qualified mechanic.

With the sail off the airframe, you can more thoroughly perform all of the inspection points listed for the six-month inspection.

Additionally, you should inspect inside the tubes for corrosion. If discoloration indicating that corrosion is present, you will need to arrest this process immediately. We have tested and approved boiled linseed oil (commonly found in most hardware stores) as an effective coating/film to apply on the inside wall surface of the tubes. Clean the tubes first, allow to dry and then apply the linseed oil.

Inspect the entire inner sail body, and in particular examine the batten pockets for wear points, especially at their stops at the front of each pocket.

WING INSPECTION

Mark “P” for pass or “F” fail at each line _____

Cable System

The cables must be checked for broken/kinked wires (frays), corrosion, niko and thimble condition. If any defect is observed, no matter how small, the cable in question **MUST BE REPLACED**. It is recommended that the entire cable system be replaced once every eight (5) years or 500 hours irrespective of service conditions except backup cabling. Cables can be obtained from the wing manufacturer or assembled by a repair station with proper expertise and equipment. Alternately they can be assembled to custom lengths and thicknesses by aviation supply stores such as Aircraft Spruce

Cables and Cable Maintenance

The cables which support the wing’s airframe are critical components of the wing’s structure, and must be maintained in an air worthy condition. It is a general practice in the design of aircraft structures to design to an ultimate strength of 1.5 times the highest expected load in normal service. Cables, like other structural components on the wing, are typically designed with a structural safety factor of only about 50% above the expected maximum load. No significant loss in cable strength can be tolerated. A cable with even a single broken strand must be replaced before the wing is flown again. A cable which has been bent sharply enough to have taken a permanent set must also be replaced immediately. Some degree of fatigue due to repeated bending of cables is almost unavoidable in an aircraft that is assembled and disassembled with every flight.

Sail Check-Up

Check the sail surface and seams there should be no cuts, ruptures, threadbare holes and torn seams on the sail. Any torn seams should be re-stitched. Cuts and ruptures on the leading edge and under surface of the sail that are not longer than 1.25” (30 mm) can be patched up with self-adhesive Dacron sail appropriately. The Dacron must be of a weight of not less than 100 g/m. Larger cuts and ruptures are to be repaired by stitching on a reinforcing piece of the same fabric (stitched along the edges). Any rupture shorter than 8” can be repaired in this manner, but more complicated repairs and all cuts near the trailing edge should be carried out in an approved and authorized manner or via the manufacturer of the aircraft.

Sail Strength

An annual Bettsometer test with a 0.045 - 0.047 inch diameter needle (1 to 1.2 mm), with wing sails fitted and tensioned for flight is to be conducted Upper & lower surface: 3 lbs or 1360 gm. There are test panels sewn on the top surface of our wings where this test can be conducted Stitches: 3 lbs or 1360 gm using a 0.045 - 0.047 inch (1 to 1.2 mm) diameter hook, pull upwards. Besides the annual check there are several criteria for testing of sails dependent on the conditions that the sail fabric is exposed to. The pilot/operator of the aircraft is responsible for determining the level of exposure that the sail experiences. UV is the killer of sailcloth and is to be avoided as much as possible. Annual testing is adequate except in cases where a more harsh and exposed environment warrants more frequent testing. In such cases every 200 operating hours regardless of time (annual or not), the Bettsometer testing should be conducted to see if sail and stitch passes. Keep an eye on the sail grommets/eyelets and all areas of the sail that are subject to extra stress, especially the wing keel section, the nose section of leading edge and the outer tip section of leading edge. There are test panels sewn on the top surface of our wings and if there is any question or doubt, these panels can be cut out and sent to the factory for testing strength of the sail material for airworthiness.

Tubing and Structure

Check all nuts, bolts, safety pins, and hardware on the wing. Check all tubing visually for corrosion, straightness, dings cracks etc. If there is absolutely any doubt, check the tubing as described below in full tubing inspection. Check all brackets and connections in the structure for cracks etc.

Full tubing inspection (at 500 hours since new and then every 250 hours thereafter) At 500 hours and then every 250 hours thereafter or if it is known that the wing has had hard landing or the trike has flipped over due to adverse weather conditions when outside, it is imperative that tubing and brackets be inspected fully with sail-off in the following manner:

To check the condition of the wing tubes the sail should be removed from the wing frame by unlocking all the fasteners that secures outside cabling and/or struts to the wing structure, removing the hang block plates or hang block as applicable so the keel pocket can slide through the keel tube, close the wing in so its in packed position and snaking the fabric off the structure. Then the tubes should be detached at the joints. The tubes are to be inspected visually. When there is suspicion of damage, the points in question should be inspected using a magnifying glass of (5-10) X magnification. A straight edge may be used on the tubing to ascertain straightness. There should be no trace of corrosion, cracks, bends or dents

Take all battens out, loosen all fasteners, struts, cabling and cross tube and leading edge junction, hardware, straps and hang block elements that hinder the sail from coming off the tube structure



After closing the wing, the frame can now be snaked out through the nose of the sail.

Fasteners

Check all fasteners (bolts, screws, rollers, nuts, splint pins etc.) for corrosion. Any corroded/rusted fasteners should be replaced. Bolts should not be worn and/or bent. Key bolts should be checked most thoroughly for cracks between the head and the bolt body. These are the bolts at the control bar side and bottom joints, the cross tube tensioning cable attach point and there are cable attachment point on the keel tube. If any cracks are observed – REPLACE IMMEDIATELY!

Battens and Batten Tips and Batten Cords

The batten profiles should be checked if the user complains of a turn against the template and the bends should be adjusted if necessary to the template. Check all the plastic batten heads and tails and replace if necessary. Batten templates can be ordered from the manufacturer. Only those battens that are known to be bent beyond the original template for wing tuning purposes and logged in aircraft maintenance log as such should be allowed to deviate from the manufacturer batten template. If any of the batten tightening cords are torn or heavily worn they must be replaced. The cord is 400 pounds spear fishing line available at many scuba shops or can be ordered from the factory. Any batten trailing edge tips that are worn should be replaced if applicable and can be ordered from the factory

WARNING: WHEN REPLACING PARTS OR INSPECTING, NEVER REUSE A NYLOCK

16. Wing Retirement

With proper care and maintenance, the Reflex series wing will remain for some years at a high level of airworthiness. Each wing has a patch sewn into the sail at the top center for UV testing. Simply cut out the panel and have a test performed. There is much that we still don't know about trike wing longevity; such as what exactly is the effective lifetime of a trike wing before material fatigue and degradation compromise the airworthiness of that wing. We do know that there are forces in nature, which can severely compromise the airworthiness of that wing, regardless of the quality of design or condition of the wing you are operating. Your safety is ultimately your own responsibility.

However, there is one subject in particular which needs to be addressed at this point--and this is wing retirement. There comes a time when the sail of any trike wing simply becomes too suspect to feel safe while flying it. Ultraviolet degradation will inevitably dictate the retirement of your wing. Judging when this occurs to your wing is best verified by an authorized service center. (SLSA trikes require the wing to be retired at 1500 hours of use regardless of condition)

All of us, as responsible and caring human beings, owe it to one another to do the responsible thing and remove any over-used equipment from the skies. We at Evolution Aircraft Inc. abhor those whose method of dealing with a wing due for retirement consists of simply passing their problem along to an unsuspecting pilot in the used wing market place. The mature thing to do, at the appropriate time, is to destroy very old wings to ensure that they cannot endanger an unknowing pilot.

Along these same lines, because wings do change hands, we feel that it is quite important to keep accurate records of tuning changes, and especially of repairs, in the maintenance log of this manual. Please consider the needs and safety of those other pilots down the road who may stand to gain from these records.

17. Limitation of Liability

The owner and operator of this trike wing must understand that, due to the inherent risk involved in flying such a unique vehicle, no warranty is made or implied of any kind against accidents, bodily injury, or death. By purchasing this wing, the owner and operator of this Trike wing assumes complete responsibility for their use of this equipment, and specifically, agrees to release Evolution Aircraft Inc. and/or their agents, from any and all liability.

18. Technical Specifications

Note: These specifications are intended only as a guideline for determining whether or not a given wing conforms to current production specifications, and whether it is in a configuration as originally designed

SPECIFICATIONS FOR RIVAL S (12.4) WING

- * Cruise Speed: 55 – 100 mph (48 - 87 Knots)
- * Max Speed: 115mph (100 Knots)
- * Stall Speed at Gross: 43 mph (37 Knots)
- * Max Takeoff Weight: 1160 lbs (526 kg)
- * Rate Of Climb (912ULS): 1000 ft/min (5 m/sec)
- * Takeoff Distance to clear 50 foot obstacle (912ULS): 920 feet (282 meters)
- * Landing Distance over 50 foot obstacle : 800 feet (244 meters)
- * Descent Rate at 482 kg gross loading: 500 feet/min
- * Glide Ratio (Tested on Revo): 9.5:1
- * Ultimate Strength: +6g, -3g
- * Maneuverable Loading: +4g, -0g
- * Wingspan: 29.5 feet (9 meters)
- * Style: Topless wing
- * Aspect Ratio: 6.2
- * Wing Area: 134 sq. ft (12.4 sq. meters)
- * Wing weight: 126 lbs (57 kg)
- * Very light roll pressure
- * High roll rate

Note: All performance figures are obtained on a REVO trike

Your new RIVAL S wing combines the best blend of low speed performance, rugged construction and easy handling that the art and science of trike wing design allows. Properly maintained and flown within its design limits will provide you many years of flying pleasure. But, like any wing, its safety is directly proportional to your diligence in maintaining and repairing it properly, and your ability to fly it intelligently and within the wings limits as well as your own limits as a pilot.

We hope your RIVAL S wing will provide you with many hours of enjoyable flying. All of us at Evolution Aircraft Inc. would like to welcome you to our growing family of pilots!

OWNERS MAINTAINANCE LOG

[illegible]