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# North Wing STRATUS XP Wing Manual

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## 1. Introduction

Congratulations on your purchase of a North Wing glider. It's had been our goal to produce the finest gliders using the most current information and design available for the type of glider and use. We have also made it our goal to serve you with all your flying needs, now and many years into the future. Since 1996 we have been designing and producing gliders/wings for both foot launch and powered launch. The light-trike wing you have purchased is not designed for powered launch or flight. Some powered harnesses may be able to be used on our light-trike wings.

Light-trike wings are not a registered flying vehicle; there is no requirement to do so with any state or country. As a result, unless you register your glider with us at our web site we will have no list of owners that are flying our equipment and no good way of contacting you directly for service or safety issues. It is also your responsibility to check with your dealer or check our web site periodically for any technical and service bulletins and information pertaining to your glider.

Thank you for choosing to fly a North Wing product. We hope you will be pleased with the product and service you receive from us. Please let us know that you are satisfied with your new glider and write us with a story of good times that you have had with our product. In like, if there is anything that you are not pleased with contact us first and let us take care of any issues with you directly. If then we need to inform other North Wing owners we will do so.

Thank you for joining the growing number of North Wing pilots, and we wish you years of enjoyable and safe flying.

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Thank you for joining the growing number of North Wing pilots, and we wish you years of enjoyable and safe flying.

## 2. Disclaimer and Warning

The Federal Aviation Administration does not require a pilot's license to operate a light-trike wing. Light-trike wings and hang gliding equipment are not designed, manufactured, tested or certified to any state or federal government airworthiness standards or requirements. Federal Aviation Regulation Part 103 states in part, "ultralight vehicles are not required meet the airworthiness certification standards specified for aircraft or to have certificates of airworthiness" and "operators of ultralight vehicles are not required to meet any aeronautical knowledge, age, or experience requirements to operate those vehicles or to have airman or medical certificates

The safety of this or any light-trike wing ultimately rests with you, because hang gliding is an inherently dangerous sport and can induce injury or death even to good pilots flying safe equipment. Because the responsibility of flying and maintaining the glider rests entirely with you, the risks of damage or injury you may cause to others and to yourself also rests entirely with

## **North Wing STRATUS XP Wing Manual**

you. We believe that in order to safely practice the sport of hang gliding you need to exercise good pilot skill and knowledge of airmanship and weather. You must also accept this responsibility that hang gliding is dangerous, fly conservatively, and avail yourself of all safety equipment appropriate to the conditions in which you fly.

No glider is totally safe. It is entirely possible to push any light-trike wing beyond its designed tolerances. This could result in a structural failure, very strong flying conditions may also cause structural failure if flown outside the gliders limits. Aerobatic maneuvers, pitch angles beyond 30<sup>o</sup> up or down, bank angles exceeding 60<sup>o</sup>, aggressive stalls, and spins are maneuvers that should never be attempted under any circumstances. We hope to provide you with many hours of enjoyable flying. If you ever need any spare parts or advice do not hesitate to contact your nearest North Wing dealer, If they are not available, contact us directly.

**North Wing hang gliding and trike products are not covered by product liability insurance.**

**From all of us at North Wing: fly smart and fly safe.**

### **3. About This Manual**

Most everything the pilot needs to know about the **STRATUS XP** from North Wing 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 STRATUS XP, or it is possible to damage it. It is best to have a dealer show you how to set up your new wing. 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 our product. 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. By purchasing or operating this product, you assume complete liability for its safe operation. North Wing offers this owner's manual simply to assist you with the features particular to this model of light-trike wing regarding it's 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 ultralight weight shift aircraft skill-building written by Dennis Pagen and other authors, also seek out professional instruction. Books do not replace professional instruction, the factory can recommend any number of professional flight training centers.

Please practice safe aviation!

### **4. About the STRATUS XP Light-trike wing**

Congratulations on the purchase of your new North Wing product. We believe it to be the finest available recreational light-trike wing in the market today.

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The STRATUS XP is a novice to intermediate light-trike wing. If this is your first trike wing you should have a minimum of 10 hrs of flight experience in a two-place trike along with an instructor's approval before flying the Stratus.

The STRATUS XP achieves good low speed performance and superb handling for many reasons. It's sail body and cut are composed of a carefully selected and applied and industry proven design of the latest materials that is matched to the leading edge curve. The sail features a leading edge pocket reinforced with a mylar insert sheet. Drag is reduced and performance is increased with a highly refined sail, streamlined tubing, clean hardware and reducing upper reflex rigging by using two internal sprogs per side . These features combine to ensure a good usable flight performance and stability.

### STRATUS XP SPECIFICATIONS

	<b>16</b>	<b>17</b>
SPAN	32.6'	34.3'
NOSE ANGLE	122 Deg.	122 Deg.
ASPECT RATIO	6.25	6.1
SAIL AREA	170 Sq/ft	184 Sq/ft
NUMBER OF RIBS TOP	18	20
NUMBER OF RIBS LOWER	4	4

(Other dimensional specifications may be found in section 7)

### 5. Design Information and Placarded Operating Limitations

Placards bearing test flight information and operating limits are located on the Gliders' left cross-tubes.

We believe the Stratus XP to be the finest available recreational flex-wing glider on the market today. It achieves an exceptional performance and very good handling for many reasons. Our gliders have a sail cut that is carefully matched to the leading edge bend, floating cross-tube, mylar reinforced leading edge pocket. These features combine to ensure a good usable glide angle, an excellent sink rate and a broad speed range making the STRATUS XP both an excellent intermediate glider and soaring wing and a reliable cross country glider.

Like any light-trike wing the STRATUS XP has been manufactured and tuned to close tolerances and its performance and safety depend on you maintaining those tolerances. We require that you read this owner's manual thoroughly and follow its instructions to the letter when

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you set up the glider, fly it, break it down for storage or shipping, or perform repairs or maintenance on it. Failure to do so will compromise the safety of your glider.

### **This glider must not:**

- a) be flown by more than one person at a time.
- d) be flown inverted or backwards.
- e) be flown with auxiliary power unless designed, installed and tested by the factory.
- f) be towed (unless the towing technique is a proven operation and done with professional instruction).

**Special care should be taken to note the operating limitations, which are clearly stated on the flight operation placard as follows:**

**FLIGHT OPERATIONS** should be limited to non-aerobatic maneuvers--those in which the pitch angle will not exceed:

- a) 30 degrees nose up to the horizon
- b) 30 degrees nose down to the horizon
- c) Bank angle 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 aerobatic maneuvers or erratic pilot technique may ultimately produce equipment failure and are specifically excluded from the warranty. (Reference workmanship warranty described in Section 10 of this manual.)

**Wing loading (add trike and pilot weight) Such as; trike with fuel= 130 lbs x pilot = 200lbs total = 330**

	16	17
Usable weight range	220-330 lbs.	280-390 lbs
Maximum stall speed	28 mph	
Minimum top speed	41 mph	
VNE (Never exceed)	53 mph	
Recommended rating	novice or higher	

### **GLIDER/ WING TESTING**

The STRATUS XP glider has undergone extensive testing and has satisfied the standards of the designers and North Wing Inc. as an ultra light glider. The STRATUS XP has not been tested to any state or federal airworthiness specification.

A combination of stainless steel trailing edge reflex lines along with airframe geometry provide the most effective positive pitching system known to date. Careful test vehicle pitch experimentation was necessary to determine trailing edge line lengths. Altering those overall dimensions, even to the slightest degree, will decrease your glider's performance, or more importantly, its pitch stability.

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You can verify the tested configuration of your STRATUS XP by using the compliance verification sheet (Section 7 of this manual).

### Description of stability system on the Stratus XP

The Stratus XP uses aerodynamic wing design and physical hardware components that when combined gives the Stratus XP positive pitch stability. These are:

- a. The combination of sweep, wing taper and span-wise twist are in the design and for the most part cannot be changed.
- b. The Stratus XP uses internal velcro straps and internal fabric ribs that helps define the airfoil.
- b. The shape of the rib camber and reflex (reband) put into the root ribs.
- c. The sprogs are used to set the height of the trailing edge and this set the minimum twist that wing should have.

NOTE: Proper adjustment of the sprogs height are critical for stability at low angles of attack.

The vehicle test described above has proved the stability system for the Stratus XP to very effective.

#### Results:

One sprog per side- can be adjusted. One reflex bridle line per side- length is set and cannot be altered.

#### Sprog settings

set at 17 degs with the keel set at 0 deg.

#### Method of adjusting sprog height

1. To adjust the sprog height, fully unzip the access zipper to gain access to the front of the sprog where it is mounted to the sprog bracket.
2. Remove the horizontal bolt and nut which secures the sprog clevis fork to the pillar block, taking care to maintain the rotational alignment of the clevis fork in the sprog at its original setting.
3. To raise the sprog, turn the clevis fork so as to "loosen" or unscrew the fork in the end of the sprog, thereby lengthening the sprog. To lower the sprog, turn the clevis fork in the opposite direction. One full turn raises or lowers the sprog about one half inch. The adjuster may be locked in place with a thin jam nut, in which case you will need to loosen this jam nut before you can turn the clevis fork.

You can usually loosen the jam nut by rotating the sprog counter clockwise before dismounting it, and then spin the nut out of the way until you have re-adjusted the clevis fork as desired.

When you have achieved the desired adjustment, run the nut against the end of the sprog, loosen the clevis fork a quarter turn, and snug the nut finger tight against the sprog. After you re-attach the clevis fork to the pillar block, while holding the nut, rotate the sprog 1/4 turn in the correct direction so as to tighten the nut. Note that the jam nut is primarily to preserve the sprog adjustment if the sprog or sprog cable is detached. With the sprog and cable fully installed and attached, the adjustment cannot change.

Note that the outboard sprogs should always be adjusted slightly higher than the inboard sprogs.

## 6. Re-Assembly From Shipping Crate

**PICTURES MAY OR MAY NOT BE OF YOUR EXACT MODLE OF WING BUT ARE FOR REPRESENTATION AND PRECEDURE ONLY.**

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 Base tube, ribs and rear LE's. Separate the left and right rear LEs. (Leading Edge). Green is right and red is left. With the wing on it's back slide the rear sections into the sail from the tip.



Turn the sprogs so they point towards the nose. Slide the rear section into the sail make sure the sprog exits the sail through the sprog zipper. (NOTE: Sprog is folded on the out side of the sail when packed) The rear section will now slid into the center section and the locating slots will locate over the pin. Make sure the LE click into place.





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Attach the black webbing strap to the bottom of the LE at the tip. Install the ¼ clevis pin from the bottom through the webbing grommet into the LE. The pin will go through the small tube inside the LE also. Install safety ring on top.



Install the base tube on the VG side (right side) of the control frame. You are now ready to set up your glider. If you have the Fast foil control frame you will put the BT on as you set up.



### 7. Setup Procedure

**PICTURES MAY OR MAY NOT BE OF YOUR EXACT MODLE OF WING BUT ARE FOR REPRESENTATION AND PRECEDURE ONLY.**

Your **North Wing** light-trike wing has unique components that were designed to set-up in the simplest, most efficient manner.

The instructions given below provide you with the step-by-step procedure for setting up your glider. By closely following these instructions, you can assure yourself a smooth, quick set-up.

Your North Wing light-trike wing should always be stored **zipper down** especially during transportation.

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The **Stratus XP** is set up with the control bar set into position at the beginning of the procedure, and it allows the glider to be set up off the ground. This is acceptable in lower wind conditions, and it is effective in keeping the sail clean.

The best value that this chapter can provide the owner is to share some techniques and procedures that other people using the STRATUS XP have discovered; things that will minimize wear or even prevent needless damage from occurring. Use this information to extend the life of your wing.

1. ASSEMBLE THE CONTROL FRAME Place the glider on the ground with the nose into the wind or nose pointing 120 degrees to the wind (if the wind is over 5 MPH) and with the zipper facing upward. Remove the ribs from their bag, unzip the cover bag, undo the glider ties and assemble the control frame base tube. NOTE: Check that all the rigging is on the outside of the control frame and check that the bolt, wing nut and safety rings are fully assembled. FIG.1&2



2. ROLL THE WING OVER stand wing on the control frame. Check to make sure the lower side wire cable thimbles have not turned 180 degs and will get kinked if tensioned. (do not attach the lower front wires at this time) FIG



3. REMOVE BAG. SPREAD WINGS carefully walk each wing out to 3/4 of it's own approximate flying position. Leave enough slack in the sail so that during the next step the ribs may slide in with minimal resistance. Set wing cross to the wind to prevent the glider from blowing over.
4. ROTATE KINGPOST UP into position and hook up reflex bridles (luff lines).



5. SEPARATE WHITE AND BLACK RIBS, white on right black on left. Insert the battens from root to tip with gentle pressure (**do not force the rib to go in**) if the batten meets resistance, lift the sail at trailing edge and gently shake the sail up and down in order to billow it. At the same time push the rib forwards. This enables the rib to go over the cross bar and L.E. tubes. You don't have to tension the ribs with the flip tips at this time. Install all ribs but the last three at the tip and the tip wand.



6. FIND THE CROSS TUBE TENSION cable retrieve line and pull it through the keel pocket till you can get the black webbing handle. Pull the shackle back and latch into the spring catch.



7. HOOK THE LOWER REAR TOP WIRE triangle ring into the same spring catch.

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**ENSURE THAT THE SPRING IS PROPERLY SEATED** so it is pushing up on the top of the latch.

- INSTALL THE TIP WAND by opening up the Velcro at tip, slip fiberglass wand into the tip receptor at end of LE tube. Make sure tip wand bottoms out on pin (apx. 4" in). Now hook tip lever socket over end of tip wand and over center lever.



- INSTALL THE LAST THREE CURVED ribs and secures all the flip tip tension levers at this time.



- INSTALL THE NOSE BATTENS (tail end first) from the nose of the glider, now seat the front end of the rib on the standoffs just in front of the nose plate. Nose ribs can stay in the glider if you wish by taking them off the stand offs at the nose when packing up.



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11. ATTACH THE FRONT FLYING WIRES at the nose plate area by slipping the ring around the nose spring catch. **ENSURE THAT THE SPRING IS PROPERLY SETTED so it is pushing up on the top of the latch.**



12. INSTALL THE GLIDER'S NOSE CONE starting with the two top velcro tabs and gently pulling the shroud down and around the nose plate to connect the two bottom velcros of the nose cone to its corresponding velcro on the under-surface.



13. ROTATE THE SPROGS into position and zip up the sail. Sprog sets between the 1" webbing strap and the zipper.



14. INSTALL THE UNDER SURFACE ribs from longest to shortest. Make sure the back ends are inserted back into the slot at the rear.



15. YOUR **STRATUS XP** IS NOW READY FOR A **PRE-FLIGHT INSPECTION**, DESCRIBED NEXT.

### 8. 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.

#### Starting at the nose:

Sight along both leading edges, checking for similar curves.

- Sight over the top of you sail from the nose and make sure your sprog heights are the same. Walk towards the tip, feeling for dents in the leading edge tube.
- Pause at the cross bar LE junction area and look into the sail through the zipper inspection access. Check all fittings, safety rings and cables.
- 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 in place.
- Insure that the tip wands are properly seated in the leading edge, and that the tension lever is correctly installed.
- Check top of king post, make sure all cables are routed correct and the luff line are not twisted or wrapped around any other cables.
- Walk to the keel, checking each of the ribs to ensure that they are properly secured.
- Check the cross tube-to-keel cable catch connection.
- Repeat first half inspection as you work your way back around the nose.
- Check the nose catch.
- 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 speed 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.
- 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 cause dangerous flight handling!!
- Generally site the entire wing for symmetry. If you see something that does not look “right”, stop and investigate.

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NEVER RUSH A PREFLIGHT!

## 9. Fold Down Procedure

To fold down your STRATUS XP, just follow the reverse set up procedure steps (common sense) 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.

TIP BAGS Unzip the sprog zipper and rotate the sprog parallel with the LE **outside** the sail. Fold sail tip at the end of LE bring the tip lever back so it is by the LE tube area. Now roll the sail to the LE.



- FOLDING WINGS IN. 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 meet resistance folding in the wings, check that the cross tube tensioning line or cable are free to run forward through the cable hole center of the sail.
- REMEMBER TO INSTALL the upper and lower king post and rear keel pads before you fold the sail up.



- FOLDING SAIL The important thing here is to simply get your sail body neatly stowed inside the Mylar reinforced leading edge pocket. Roll the sail neatly from the rear area forwards to nose first, secure with center strap then roll the sail neatly down at the tips. Also, some owners prefer to alternate folding, then rolling, their sail to minimize potential permanent creases developing over time.

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- **ATTACHING SAIL TIES** Fasten the first tie just aft of the rear cable (or X-bar latch). 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.



### 10. About Flying the STRATUS XP wing

This is not instructions on how to fly a Ultra light trike, only tips on how this wing can fly and what to expect. You must have professional flight instruction to fly as safety as possible.

#### *Launch*

We recommend that you fly in no wind early morning conditions for your first flight on a new wing or solo flight.

You need to feel only what the wing is doing to get use to the wing. If you are correcting for turbulence you won't know if the trim is correct or what the wing is doing and over controlling is possible.

#### **Minimum controllable airspeed and minimum sink airspeed**

There are two important airspeeds with which all light-trike wing pilots should be intimately familiar; minimum sink airspeed (hereinafter referred to as MSA) and minimum controllable airspeed (MCA). Minimum sink airspeed is that speed at which your descent rate is the slowest possible. It is the speed to fly when you want to maximize your climb rate in lift, or slow your rate of descent to a minimum in non-lifting air. (You would normally not fly at MSA in sinking air; the strategy there is normally to speed up and fly quickly out of the sink. By minimizing your time spent in the sinking air you minimize altitude lost, even though you have momentarily increased



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your sink rate by speeding up.)

*Minimum controllable airspeed* is that speed below which you begin to rapidly lose effective lateral control of the glider. Recognition of this speed and its implications is a more subtle problem than many pilots realize. We have seen several instances of pilots who were having a lot of trouble flying their gliders simply because they were unknowingly trying to fly them too slowly; below the speed at which the glider responded effectively to lateral control inputs. It is our opinion that a great percentage of hang gliding accidents are caused by inadvertent flight below MCA, and subsequent loss of control of the glider with impact preceding recovery. Such incidents are usually attributed to “stalls,” but it is not the stall per se that causes the problem, indeed the glider need not even be “stalled” in the traditional sense.

### **Turns**

The **STRATUS XP** has a straight-forward flight characteristic, typical for a defined airfoil flex-wing. The glider can be easily directed into a turn even at low flying speeds with the VG off to ½ on. At full VG tight the glider can become very difficult to turn even to the point of uncontrollable if trying to slow the glider at to slow of airspeed.

However, to obtain the best handling characteristics and fast roll rate, it is advisable to pull in for a little extra flying speed, then enter the turn, move to one side and push out slightly. The **STRATUS XP** will maintain in a turn of a certain bank angle and radius until the turn is removed. Give yourself an extra margin of safety and DON'T fly your glider at the slowest possible airspeed when searching for lift close to the terrain.

### **Glider trim speed**

Now that we talked about air speed effecting handling, let determine if your glider is at a proper trim speed. You can make sure you are at a good trim speed by flying your glider in smooth air and with ¼ VG setting. Let the control bar go to trim with hands off the bar the glider sure not stall, you should have to push out on the bar from trim at least 3 to 4 inches before stall does accurse. (Or slow down 4 to 5 mph)

If you find the glider is flying to slow to do this you will need to more your hang point forwards by one hole at a time till you have proper trim speed.

### **Themaling**

This is also very straight-forward, the trim speed of the **STRATUS XP** should be slightly faster than the speed that will give you the best climb rate in a thermal. Once you have centered a thermal, push out as much as possible without stalling. Maintain anywhere from 10 to 35 degree bank angle, depending on the nature and diameter of the thermal. The **STRATUS XP** will maintain a certain bank angle and radius without further input.

### **Stalls**

When practicing stalls always make sure that you have sufficient altitude. (have at least 300 feet) Push the control bar forwards slowly dropping 1 mph per second till the stall accurse. The stall characteristics of the **STRATUS XP** are very straight-forward. The **STRATUS XP** will stall without a tendency to drop a wing, the nose will pitch down and the glider will regain flying speed. There is not a lot of altitude lost in this type of maneuver. Never stall your glider completely by pushing out quickly and pitched-up very high. This is one of the most

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uncontrollable and dangerous maneuvers for any tailless aircraft and can result in a tail slide and severe tumble. Stalls in a coordinated turn are difficult to do by mistake. If you push out too much in a turn the glider will turn tighter, unless you are flying very slowly, in which case you may enter a spin (see Spins).

### ***Spins***

The **STRATUS XP** will strongly resist spinning. However should you stall one wing in a turn, move your weight forward and the glider will recover quickly from a spin (half a turn) without entering extreme attitudes and without extreme loss of altitude. This is due to the **Stratus** positive roll-yaw coupling and a neutrally balanced roll characteristic.

### ***Landing***

This is a simple matter. Your final approach should be a straight glide (with or without power) into the wind at faster than best L/D airspeed. Bleed your speed off slowly, wings level, and ground skim until the wing settles again and then push the bar out a little more for soft touch down. All this you should have learned in your flight lessons.

## **11. Transportation and Storage**

The STRATUS XP should always be stored with the zipper facing down, especially during transportation. There are fewer potential “wear points” with the wing riding this way. Additionally, with the zipper down less water will collect inside of the cover bag in case of rain.

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 (available through North Wing) 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.

## **12. Regular Maintenance Schedule**

This section contains a recommended schedule of periodic maintenance. None of the items in this section are a substitute for the continual and consistent practice of proper pre-flight inspections and immediate maintenance of any items on the glider that require it. Safety requires that your glider be fully airworthy for every flight. Nuts and bolts must always be secure, safeties must always be in place, and damage to any part that could compromise the airworthiness of the glider cannot be tolerated. If you have a question about the need to repair or replace some part of your glider, feel free to contact your dealer or North Wing directly. It is not always obvious which items require attention and which may not. Minor dents or dings in a non critical location on an airframe tube may not require any repair or maintenance. On the other hand, a wire that has been kinked one time can fail very quickly after that, and should be

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replaced immediately. A control bar corner fitting that has had a significant landing impact may have a crack that is almost undetectable, but which could cause the part to fail catastrophically at a later time.

If you have the abilities in glider maintenance then you the owner can work on your own glider. Other wise we recommend that you have all maintenance work done by your North Wing dealer.

The STRATUS XP 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.

### Sail

The best thing you can do for your sail is to always pack up your glider in the glider bag as soon as you are done flying. Do not carry your wing on top of a car without the bag, even for short distances.

Sun and weather cause more deterioration than hours of flying. Keep your STRATUS XP covered when not in use.

### Sail Tears Less than 1" Long

**Skill Level:** *Owner or higher*

**Tools:** Scissors

**Parts:** Adhesive sail repair cloth from sail repair shop or aviation materials supplier

### Task Description:

Sail tears up to 1" in length can be repaired using an adhesive sail repair cloth provided the tear is NOT within 1" of a seam or an edge of sail. Most sail color can be reasonable matched or coordinated. The patch should extend at least 1" in all directions from the tear.

Follow these steps:

1. Prepare the surface where the patch will be applied by washing it with a damp cloth and letting it dry thoroughly. If the patch area feels contaminated with any substance, try a mild detergent followed by thorough rinsing with clean water and drying. You can also use alcohol or acetone to clean the area.
2. Cut the patch material to the required size. Since this task is only approved for tears up to 1" long, the maximum patch size should be 2" wide by 3" long. Rounding the corners of the patch will reduce the tendency of the patch to peel off or snag on something.
3. Remove the backing from the patch and apply patch to torn area.

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4. Using a smooth hard material as a backer board under the patch area, roll the patch with a small roller such as a wall paper seam roller.

The wing can be flown immediately after applying an adhesive patch.

### **Sail Tears Greater Than 1” Long**

**Skill Level:** Factory Repair or North Wing Approved Sail Repair Shop

**Tools:** Not applicable

**Materials:** Dacron sail material in several colors

#### **Task Description:**

Sail tears longer than 1”, or tears that are within 1” of an edge or seam must be repaired by a certified sail repair shop or returned to North Wing for repair. In most cases, the sail must be removed from the frame and shipped to the sail repair shop.

### **Wing Cleaning**

**Skill Level:** Owner and higher

**Tools:** Damp cloth, pail, soft brush

**Materials:** Water and possibly mild detergent, aluminum polish/cleaner, WD40

#### **Task Description:**

The sail fabric should be cleaned regularly with a soft damp cloth. If the wing is exceptionally dirty, it can be washed with a mild detergent only. Keep detergent washing to a minimum. Acetone or alcohol can be used to remove stubborn stains without harming the sail. However, rinse thoroughly with water after cleaning with these chemicals. Because of the acid in their system, bug grime should be removed immediately to prevent long term deterioration of the sail.

All cables can be cleaned with a soft damp cloth. The plastic coating on the wing cables can be cleaned with WD40 or household cleaner if necessary.

Wing struts are anodized and can be cleaned with a soft damp cloth, or with a mild detergent. If placards, such as the “EXPERIMENTAL” placard is attached to the strut, be careful not to scrub the strut to avoid removing or damaging the placards.

Other exposed aluminum tubes, keel tube, cross bars, down tubes, base tube, leading edges, and ribs can be cleaned with a soft damp cloth or a mild detergent. In some cases it may be desirable to polish these tubes with a mild aluminum polishing cloth and compound.

### 13. 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.

Check sprog height.

Inspect the sprog cable for wear.

Inspect all rigging and components. Replace any worn or bent 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.

### 14. 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 STRATUS XP, you should have the sail removed for a complete inspection at least once a year. This should be done by an authorized service center.

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 tube first, allow it to dry, then apply the linseed oil.

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

It is recommended that you annually replace the lower cables.

**WHEN REPLACING PARTS OR INSPECTING PARTS THAT REQUIRE REMOVING NUTS.....NEVER REUSE A NYLOCK NUT.**

**15. Glider Tuning**

If your glider is new and has a slight turn (with hands off it takes 2 seconds before the turn is a problem) we suggest flying the glider for 4 to 5 hour before tuning as some turn go away after the sail is broke in.

Turns are caused by an asymmetry in the glider frame or sail tension. If a turn only appears at VG settings of 3/4 to full tight, it may be an indication that the sprogs are set assymetically, to high on the side the glider turns to.

**Airframe**

Check the leading edges for possible bent tubes. Check that the keel is not bent to one side. Check for symmetrical twist in the leading edges by checking for symmetry in the alignment of tip wand and Sprog height.

If no tubes are obvious to bends then try the adjustment chart below. If any tube are questionable bent then take the tube out and inspect before moving on.

**Ribs**

Check the ribs for symmetrical shape.

Symptom	1 <sup>st</sup> Adjustment	2 <sup>nd</sup> Adjustment
Tail heaviness (flies too slow)	B	G, Both C&D
Nose heaviness (flies too fast)	A	H, Both C&D
Right turn	E	K,C
Left turn	F	L,D
Yaw unstable (wont track straight)	G	I
Roll is unstable (roll response to fast)	J	G
Roll too stable (heavy force required to enter into roll)	I	H
Wing Breaks to left in a stall	L	E
Wing breaks to the right in a stall	K	F
Trailing edge flutter	N	J

**Table 4.2-1: Wing Tuning Diagnostics**

Code	Description of Corrective Adjustments
A	Move king post back (1/2" at a time)
B	Move king post forward (1/2" at a time)
C	Increase camber on the last 3 cambered right tip ribs by 1/4", or decrease the same on left tip by 1/4"
D	Increase camber on the last 3 cambered left tip ribs by 1/4", or decrease the same on right by 1/4"
E**	For a strong turn, increase the tension of the right leading edge pocket by

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	inserting shim on the fiberglass wand or loosen the tension of the left leading edge pocket by cutting down the tip wand. See description below for inserting shims.
F**	For a strong turn, increase the tension of the left leading edge pocket by inserting shim on the fiberglass wand or loosen the tension of the right leading edge pocket by cutting down the tip wand. See description below for inserting shims.
	<b>**If your handling is acceptable than increase LE tension, if your handing could be improved then decrease the LE tension.</b>
G	Tighten leading edge pocket on both sides by adding shims. See description below for inserting shims.
H	Loosen leading edge pocket on both sides by shorter tip wand. See description below for cutting down tip wand.
I	Loosen rib tension on both sides symmetrically except for root rib and the last 3 ribs.
J	Tighten rib tension on both sides symmetrically (except for root rib and the last 3 ribs.....they should already be tight)
K	Tighten rib tension on the Right side ribs #4–8 or loosen Left side. (Root Rib and last 3 tip ribs should be tight) Mid span ribs should be loose to moderate.
L	Tighten rib tension on the Left side ribs #4–8 or loosen Right side. (Root Rib and last 3 tip ribs should be tight) Mid span ribs should be loose to moderate.
M	Loosen tension on ribs #2-4 on both sides to remove excess reflex from these ribs
N	Tighten rib tension in the locality of each problem area

**Table 4.2-2: Wing Corrective Adjustments**

### Batten tension

One of the most effective way of getting a turn out of a glider is to increase tension in the mid area ribs on the side the glider is turning to. Keep the 2 center ribs and the 3 tip ribs tight. Mid span ribs should be loose to moderate in tension. So you can always loosen the ribs n the opposite side if the side you want to tension id already tight.

### Tip Wand

You adjust your LE tension by reducing the length or adding length to the tip wand.

To reduce length you will cut of the end of the wand to add length you can add a shim inside the tip wand tube. This change should only be done if instructed by a North Wing dealer or a factory rep.

This is done to gain handling if the LE is to tight or to reduce yaw if the LE is to loose.

Also can be done asymmetrically for turns or uneven stall break.

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The amount of adjustment required is dependent upon the specific problem and varies from wing to wing. Therefore, it is important to make only one change at a time. Make a small change and then test the effect of those changes by flying the wing.

\*For LE tension only add or cut  $\frac{1}{4}$  at a time.

\*For rib tension only tighten or loosen 3 turns.

It is best if these adjustments are made by someone with wing tuning experience since it takes practice and patience to tune a wing properly.

### **16. Wing Retirement**

With proper care and maintenance, the STRATUS XP will remain for some years at a high level of airworthiness

There is much that we still don't know about light-trike wing longevity; such as what exactly is the effective lifetime of a light-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 light-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.

All of us, as responsible and caring human beings, we owe it to one another to do the responsible thing and remove any over-used equipment from the skies. We at North Wing 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 gliders 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 light-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. Practiced even under the best circumstances, flying aircraft of any kind is a high-risk sport or activity. By purchasing this wing, the owner and operator of this Light-trike wing assumes complete responsibility for their use of this equipment, and specifically, agrees to release North Wing and/or their agents, from any and all liability.





