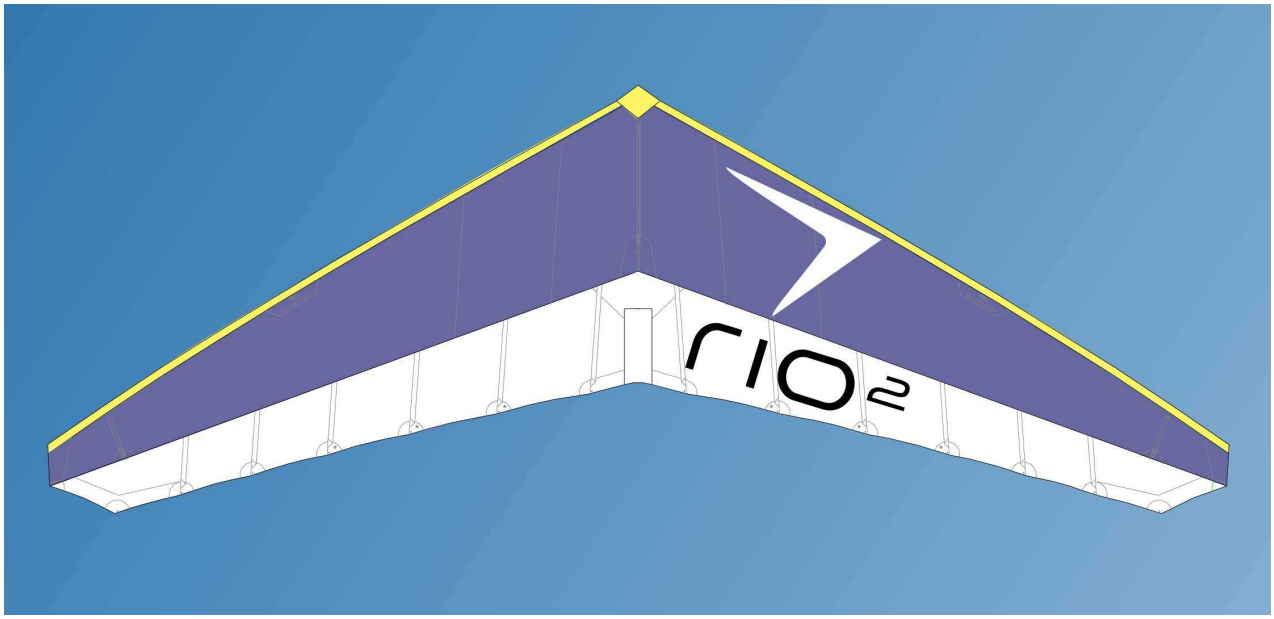
Rio 2 17

Owner's Manual



BHPA certificate of air worthiness
number: 0111174

Before flying your glider please read this manual completely, check the position of the hang loop (starting position shown in this manual) and do a thorough pre-flight check.

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INTRODUCTION

Congratulations on your purchase of an Avian Rio 2. You are now the owner of a versatile, sports hang glider. We hope that you will experience many enjoyable hours of safe flying on your new Rio 2.

This manual is designed to help you get the most from your Rio 2. Please read this manual completely before flying, check all battens against the batten profile (adjusting them if necessary) and do a thorough pre-flight check.

Please make sure your first flight on your new glider is in perfect conditions from a site with which you're familiar. If you are uncertain or have any problems with your glider, **DO NOT FLY**. We have a section on trouble-shooting in this manual that features some of the more common problems that pilots have encountered, and our recommended solutions. If you are still not sure, contact your local dealer or the Avian factory before you fly.

PLEASE NOTE

Avian Ltd does not have commercial product liability insurance.

Avian hang gliders are built using materials and fittings to the industry standard or better. Avian hang gliders are subject to Avian quality control and testing prior to delivery to the customer.

Once possession of the glider passes to the customer, its maintenance and condition become the responsibility of the owner or pilot. Any concerns or queries about the glider's subsequent airworthiness MUST be referred back to the local dealer or the Avian factory.

Hang gliders must be:

- stored correctly
- treated with respect
- checked before take-off and after heavy landings
- flown within their flight envelopes
- regularly maintained

Failure to do any of these courts disaster.

Look after your aircraft!!

WHAT'S NEW ON THE RIO 2?

The Rio 2 has been improved in many ways compared to the original Rio. For a full explanation of all the many improvements check out the website. www.hanggliding.co.uk

OPERATING LIMITS

1. Minimum pilot rating: Club pilot.

2 Manoeuvres:

1. Aerobatic manoeuvres are not permitted.
2. Pitching the nose up or down more than 30 degrees from the horizontal is not allowed.
3. Do not exceed more than 60 degrees of bank
4. Do not fly the glider inverted or backwards.
5. Do not fly with auxiliary power without factory approval.
6. Do not fly with more than one pilot.

3. Hang Glider Payloads:

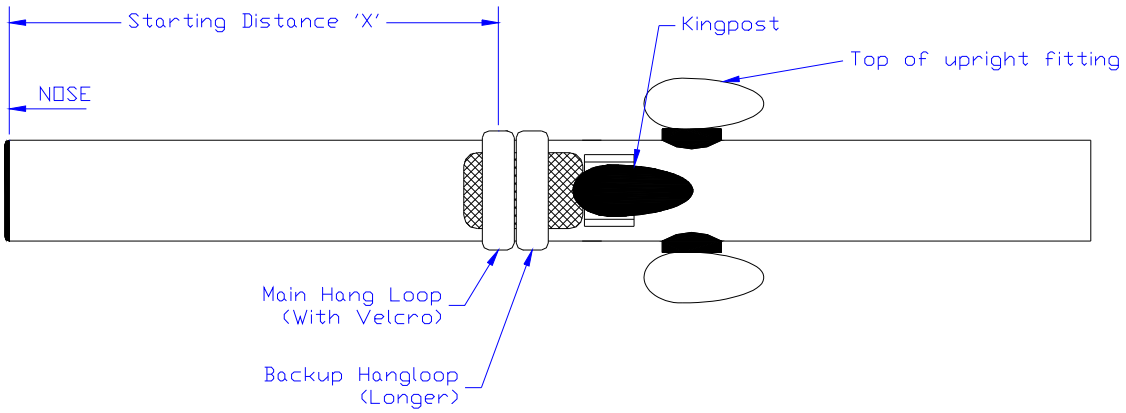
Pilot clip in weight range:

Glider Size	Min	Max.
Rio 2 17	14.5 stone	20 stone
Rio 2 17	203lb.	280 lb.
Rio 2 17	92kg	127kg
Rio 2 17 Pilot + Power unit		140kg

Pilot weight without harness: (Estimate for information only. Calculated as Payloads less 16kg. I.e. Assuming Pilots Harness clothing and kit is 16kg.)

Glider Size	Min	Max.
Rio 2 17	12 stone	17 1/2 stone
Rio 2 17	168lb.	245lb.
Rio 2 17	76kg	127kg

4. Hang Point Position Range (Pitch trim)



The hang loop is attached around the keel and should be within the following range. A recommended starting position is also shown. (If for example the hang loop had been removed and you are not sure where to replace it.) When you get the best position for your self, mark the keel with a felt tip pen or record a measurement for future reference. (See also Tuning p 13.)

Glider	Max Forward	Max Aft	Starting Position (X)
Rio 2 17	**1650mm**	**1700mm**	**1665mm**

RIGGING THE Rio 2

The glider can be rigged either flat on the ground or with the glider supported on its control frame. The latter should only be attempted in light wind conditions, but is useful in confined spaces or where the terrain is likely to cause soiling or damage to the sail.

Flat rigging

1. Lay the glider on the ground with the nose pointing into wind. Unzip the glider bag, roll the glider so it is the right way up and remove the bag. Take care to keep the inside of the glider bag clean as any dirt will be transferred to the glider when the bag is replaced.

2. Remove the glider ties and take the battens out from on top of the sail.

3. Lift the kingpost into position making sure that the sail is not caught at the base of the kingpost. Connect the tack hook and ensure that the 'luff lines are not twisted or tangled and are free from any fraying etc.

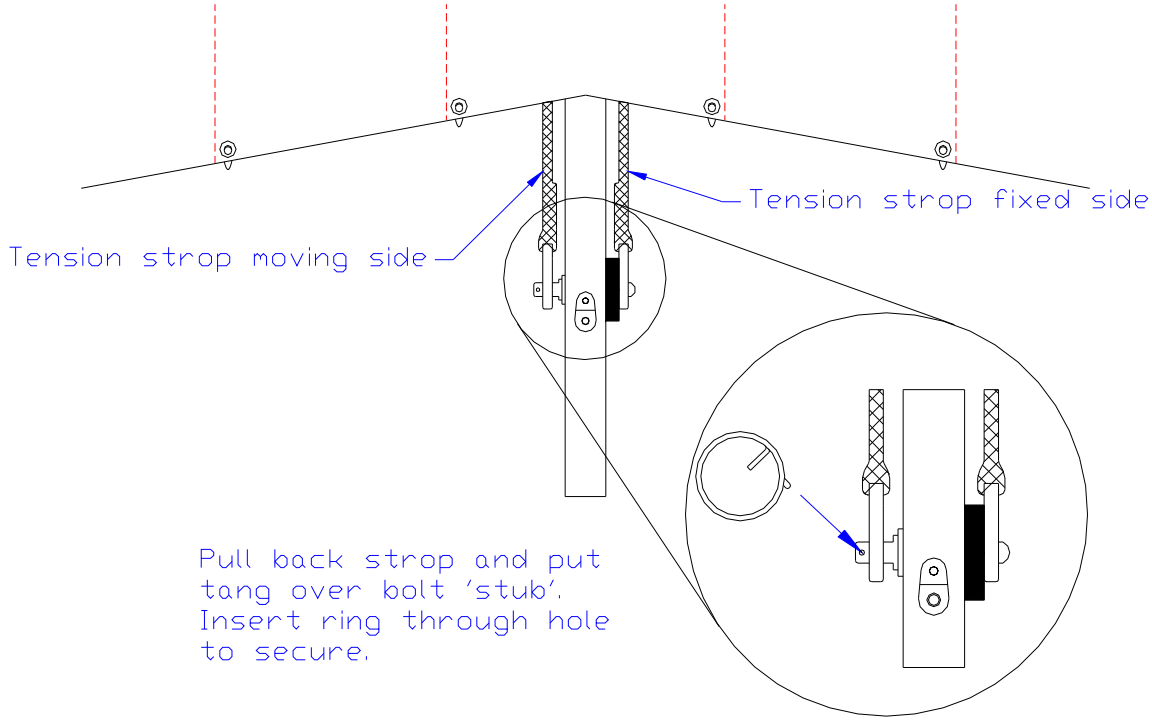
4. Open the wings slightly, then walk them out to about 3/4 of their full extension. If you are rigging alone, move each wing only a short distance in turn. Due to the geometry of the cross-tubes, attempting to move one wing through a large arc when the wings are nearly parallel exerts high loads due to the large leverage. The increased load in certain areas may cause damage to components. Also to prevent damage to the nose plates, ensure that you do not lift either wing tip higher than knee height. If there is any resistance check to see what is causing it and free the problem before continuing. **Do not attempt to force the wings apart**.

5. Assemble the 'A' frame flat on the ground. Attach the speed bar below the keel facing downward, insert the two stainless pins from the back of the base bar and fit the safety rings. **PUT THE RINGS IN IMMEDIATELY - DO NOT LEAVE THEM UNTIL LATER.** Thread the VB cord through the cleat in the speed bar and tie a knot in the end. (To prevent the cord from accidentally disappearing into the uprights.)

6. Lay the battens on the ground and pair them up, red with green, checking that corresponding batten pairs have the same profile. This is a good habit to get into as it will reduce the chances of launching on a glider with a turn caused by asymmetric shaped battens. Periodically the battens should be checked against the batten profile. The battens should all be stored clipped shut to prevent losing the tension settings.

7. Insert the battens smoothly starting with the first 'normal' curved batten in from the wing tip, working from the tip towards the centre chord. Insert the batten in the pocket inboard of the washout batten. (The compression struts and washout battens are rigged later.) Keeping the trailing edge low and slowly easing the battens into their respective pockets will help increase sail life. (On a new glider a little silicon spray on the batten ends will help them slide in smoothly.)

8. The glider can now be tensioned. Remove the split ring from the special bolt located through the rear of the keel tube. Pulling first the two cords that come out of the keel, pull the cross-tube webbing back. Check that the cords are not twisted. Locate the stainless tang over the stub of the bolt and secure by replacing the split ring. If the tension feels too tight, stop and see what is causing the problem. **DO NOT FORCE IT**. (Consult the trouble-shooting area of this manual for possible causes.)



9. Push the battens fully in the last little bit. (With a new sail the battens may not go fully home unless pushed.) The batten clip ends should be clipped open, inserted in the eyelet and rotated and clipped shut. Work from the keel outboard towards the tip. When you get to the washout batten, rotate it out and clip it in the trailing edge eyelet in the same way as with the other batten ends. Then zip up the under surface at the inboard end of the washout batten. The batten nearest the wing tip can only be inserted when the glider has been tensioned. These battens are referred to throughout this manual as compression struts. On the Rio 2 this strut is straight and locates onto a metal hook on the back of the leading edge tube. The outer end is clipped as before. The small piece of Velcro at the tip of the sail should be closed last.

10. The under surface battens should also be inserted when the glider is tensioned. They should be pushed home so that only the rope projects from the batten pocket. Insert the most outboard under surface batten first. The under surface battens can be pushed home with another under surface batten or compression strut.

11. The glider can now be stood up. Check the wind conditions and make sure the glider is pointing into wind. If you have a helper, brief them well but control (hold on to) the nose of your glider yourself. Ensure the wires are not twisted, then stand the glider on its control frame. (Your helper could lift the keel at the same time as you lift the nose.) Hook the swan catch on at the nose rotate to tension the lower rigging and then insert pip pin through the nose channel, swan catch and safety washer.

12. Insert the nose batten if not already inserted. Some people prefer to put the nose batten in before the wings are moved out at all or to leave the nose batten in the glider when packed. This is recommended but it should be remembered that the nose batten will be more prone to becoming misshapen if left in a packed glider. Remember to check its profile against the batten profile when you check the other battens.

13. After checking that the nose catch is correctly attached, with safety washer in place, fit the nose cone. DO NOT fly without a nose cone.

14. The glider is now fully rigged and you should complete a thorough pre-flight check **before** you fly.

If there is a significant wind we suggest that the glider is left **flat** on the ground, nose into wind and securely weighted or tied down at the nose until you are ready to fly. In light winds the Rio 2 may be left standing on its 'A' frame, tail into wind but be wary of gusts of wind, thermals and dust devils. Keep a close eye on your glider or make sure it is securely tied down.

Rigging on the 'A' frame

This is useful in confined spaces or where the terrain is likely to cause soiling or damage to the sail, but should only be attempted in light-wind conditions.

1. Lay the glider on the ground. If there is any wind the nose should be pointing cross or down wind. Unzip the bag and remove enough ties to assemble the 'A' frame. Attach the speed bar, pointing forwards and insert the two stainless pins from the back of the base bar and fit the safety rings. **PUT THE RINGS IN IMMEDIATELY - DO NOT LEAVE THEM UNTIL LATER.** Thread the VB cord through the cleat in the speed bar and tie a knot in the end. (To prevent the cord from accidentally disappearing into the uprights.)

2. Insert the nose batten or, if it was left in the sail, move it onto its seat on the keel. Stand the glider on its 'A' frame. Remove the bag and remaining ties and take the battens from the top of the wing. Lift the kingpost slightly so that it rests on the nose batten.

3. Open the wings slightly then walk the wings out to about three quarters of their full extension. If you are rigging by yourself move each wing a short distance in turn. NB: Whilst spreading the wings, particularly when the glider is standing on its 'A' frame, it is essential that the leading edges and keel are kept in the same plane to avoid distortion of the nose plates or any other component. If it is difficult to open the wings. Stop and find out what is wrong DO NOT FORCE the wings apart. It is possible to get the kingpost caught behind the cross tubes, wires caught around things etc. Check to find the cause and correct before opening the wings any further.

4. Take care to place the tips on a piece of ground that is not likely to cause them damage. Leave the tip socks on for protection. The glider should now be standing on its 'A' frame, wing tips and keel.

5. Lift the kingpost into position and connect the tack hook securely, ensure that the 'luff lines aren't twisted or tangled and are free from any fraying etc.

6. Making sure that the wires are not kinked, attach the nose swan catch, pip pin and safety washer.

7. Lay the battens on the ground and pair them up, red with green, checking that corresponding batten pairs have the same profile. This is a good habit to get into as it will reduce the chances of launching on a glider with a turn caused by asymmetric shaped battens. (Periodically the battens should be checked against the batten profile.)

8. Working from the centre chord towards the tip put all but the last 3 curved battens into their pockets. Keep the trailing edge low and slowly ease the battens into their respective pockets. Leave the tip socks on.

9. Before tensioning the glider make sure you have opened the wings as far as possible. Tensioning will be much easier if you can get someone to lift a wing tip slightly, thus opening out the wings still

further. Remove the split ring from the special bolt located through the rear of the keel tube. Pulling first the attached cords, pull the cross-tube restraint webbing back. Check that the cords are not twisted. Locate the stainless tang over the stub of the bolt and replace the split ring. If the tension feels too tight, stop and see what is causing the problem. **DO NOT FORCE IT**. (Consult the trouble-shooting area of this manual for possible causes.)

10. Remove the tip socks and swing out the washout batten. Push all battens fully home. (With a new sail the battens may not go fully home unless pushed.) Clip all the batten ends working from the keel outboards. When the washout battens are clipped in place zip up the double surface zip.

11. Take the compression struts (these are straight) and insert them ensuring that they locate onto their hook on the leading edge. Clip the end and replace the Velcro.

12. If not already in place, insert the nose batten and locate it on its seat just in front of the nose plate. (It is recommended to only remove the nose batten occasionally to check its profile. Otherwise leave it in situ at all times.)

13. The under surface battens are more easily inserted once the glider has been tensioned. They should be pushed home so that only the rope projects from the batten pocket. Put the most outboard under surface batten in first, the battens can be pushed home with another under surface batten, compression strut or finger.

14. Double check that the noses catch is correctly attached, with the safety washer in place and fit the nose cone.

15. The glider is now fully rigged and you should complete a thorough pre-flight check before you fly.

In light winds the Rio 2 may be left standing on its 'A' frame tail into wind but be wary of gusts of wind, thermals and dust devils. Keep a close eye on your glider or make sure it is securely tied down.

PRE-FLIGHT CHECK-LIST

Always using the same assembly and packing procedure will help to eliminate rigging mistakes. After rigging always carry out a pre-flight check. Clearly the most obvious thing to do is to take a look at the whole glider. Stand back and have a look at your aircraft. Check that it looks the correct shape from top and bottom. Check that the wing twist looks even from the side and that the glider looks symmetrical. If you notice anything unusual then investigate this first before continuing with the more detailed pre flight list below. If you notice something unusual then obviously make sure you sort it out before you fly. Afterwards may be too late. Some of the detailed pre-flight checks should be carried out during assembly but the following details must all be checked prior to take off:

1. All tubes are straight and not dented. If you suspect tube damage but cannot see it DO NOT FLY. A full factory service is often the only way to see some tube damage.

2. Cross-tube hinge, nose plates and 'A' frame fittings OK.

3. All sail seams intact with no frayed stitching, particularly in high stress areas (*e.g*. wing tips, junction of keel pocket and sail *etc*.)

4. Battens correct shape and undamaged.

5. All wires, nuts and bolts secure.

6. All quick release fittings secure:
(i) cross-tube tensioner
(ii) nose catch (check the clevis pin and split ring as well)
(iii) compression strut battens correctly located on leading edge hook
(iv) quick pins and rings secure on bottom bar
(v) outboard leading edge section fully engaged. Webbing sail attachment at tips in good condition and correctly positioned in their slots. (Be especially vigilant if the leading edge has been short-packed recently.)

7. Cross-tube tensioner strop not frayed and twist free.

8. Batten tensions symmetrical on both sides of the glider. The snap ends should be in good condition and snap closed when rigging.

9. Hang loops in good condition.

10. The glider is symmetrical when viewed from the front or rear.

11. Unzip the under surface and check the centre junction. Check that the cross-tube hinge bolts are secure and webbing loop is in good condition. Sight down the cross-tubes and check they are undamaged.

12. Check the four nose plate bolts are secure.

13. Check that the Allen head bolts at the lower upright fitting are secure and fronts flush with the fitting. Check that the top of upright bolt through the keel is secure. Check that the double button pins are holding the upright to the fittings.

14. Walking along the length of the leading edges feel with your fingers to check that they are free from dents. Check that there is a similar leading edge curvature when looking down the inside of the wing from the nose to each wing tip.

15. Ensure the webbing is correctly seated into the groove on the plastic end caps at the wing tips.

16. Check through the sail inspection zip to ensure that the wing wire and cross-tube leading edge bolts are secure.

17. Check all zips are done up.

18. Check that the keel is straight and the tensioning strap is secure, correctly fitted and the split ring is in place, as shown in the previous diagram.

19. Ensure the kingpost is correctly positioned, straight, free from dents and held securely in position via the tack hook.

20. Check the 'luff lines are not twisted or frayed and are securely attached. If the outer 'luff lines become caught under any of the battens this will cause a significant turn in the glider when flying, so always ensure the 'luff lines are free before launching.

21. Check the wires are undamaged. Look for signs of corrosion and fraying. Pay particular attention to inspection of the wing wires, as in normal flight these are the most heavily loaded. **INSPECT BOTH ENDS: THE BASE BAR END AND THE CROSS-TUBE JUNCTION END. REMEMBER: IF IN DOUBT DO NOT FLY - CONSULT AVIAN FOR ADVICE.**

22. Finally, special attention should be paid to quick-release fasteners, check that all are secure. Pay particular attention to the base bar quick pins as it is possible for the safety rings to become detached from the pin. The most likely cause is forgetting to put them in when rigging. However moving the glider in long grass and or touching the safety rings against something can remove a safety ring. The problem is minimised if you put the pins in from the back of the base bar, so that when the glider is sitting on its keel the head of the pin rather than the safety ring is in contact with the ground.

FLYING THE Rio 2

Please note the following is not meant to be an exhaustive flying manual but merely a brief note and should be read with that in mind. It is recommended that your first flight on the Rio 2 is from a site you know well, in ideal flying conditions and using your normal flying gear. Remember: only change one thing at a time.

Take off

Remember that during the first few seconds of flight on a new glider it is likely to feel different to previous aircraft you have flown. Before take-off make sure you've 'pre-flighted' the glider, that you are clipped in and that you have performed a hang check. **Have you checked the starting position for the hang loop?** It is given at the front of this manual. On take-off the wings should be held level with the nose slightly raised. A strong and committed take-off run is always recommended. Keep the angle of attack low until you are running fast. Once sufficient air speed has been achieved increase the angle of attack gradually to take off. Fly straight out from the hill for a few seconds. **If you fly too fast and over control** (a series of unintended 'S' turns) **remember to relax and gently slow down.** Once settled in flight move your hands, one at a time, to a comfortable position on the base bar.

In Flight

The control in both pitch and roll is light and precise. Coming from a beginner's glider the controls might seem very light. Accordingly the glider should be flown with moderate and precise inputs. The glider should not be flown too slowly or in a semi-stalled condition as the roll response becomes much slower. Likewise it is important not to fly it too fast until you are familiar with the glider's control responses. Once well clear of the ground, any other obstacles and while keeping a good look out it is recommended to experiment with gentle turns at trim speed and various slightly increased flying speeds. This idea is practise until you are able to fly accurately at different airspeeds.

Stall

The Rio 2 recovers quickly from stalls but will lose height doing so. A wing close to the stall becomes difficult to control. For both these reasons the glider should be flown with sufficient, but not excessive, air speed close to the ground, hill, or any other aircraft or obstacle.

Spin

Hang gliders are generally resistant to spin and it is very unlikely that you will ever experience a spin in normal flight. To recover from a spin pull the bar in and increase speed BEFORE applying opposite bank.

Flying when wet

DO NOT TEST YOUR NEW GLIDER IF IT IS WET. Wet gliders do not fly nearly as well as dry gliders because water droplets on the leading edges disturb the airflow over the wing. The result is that the glider does not perform so well and the stall speed is increased. *I.e.* it will not be possible to fly the glider

as slowly as if it were dry. A wet glider stalls more easily, takes longer to recover from a stall and is more prone to spinning.

If you get caught in the rain you will notice the above effects increase as the glider gets wetter. You will have to fly faster to avoid stalling and should be especially careful when turning or landing. WE ADVISE THAT, WITH A WET HANG GLIDER, YOU FLY FASTER, ESPECIALLY WHEN DOING ANY MANOEUVRES NEAR THE GROUND OR OTHER AIRCRAFT and use low bank angles if possible.

Landing the *Rio 2*

The secret of a good landing is good field selection followed by a precise approach with adequate air speed.

Always plan your landings from high up and make sure you can get your feet out of your harness well before landing. Check the surrounding air for other aircraft preparing to land. Look and check that your approach and over-shoot path have as few obstacles as possible and be sure of the wind direction. Never choose to land immediately behind other gliders or obstacles, land to one side, you'll make a lot more friends. Flying into wind, try and resist the temptation to push out and slow down until your feet are close (50cm) from the ground. You should aim to fly parallel with the ground for a few meters while gently slowing down before a final flare.

POST FLIGHT INSPECTION

After landing, especially if heavily, the glider should be inspected as outlined in the pre-flight inspection.

DE-RIGGING

De-rigging is largely the reverse of the assembly sequence:

De-rigging the glider flat

1. Remove the nose cone and release the lower nose wires. Lay the glider flat on the ground and into wind. Remove the under-surface battens and the compression struts. If you intend removing the nose batten from the sail, do so before releasing the cross-tube tension or when you are about to put the glider into the bag with the wings together.

2. To unclip the battens: unclip the white clip batten fitting by rotating it around the eyelet. Remove it from the eyelet and then clip it back parallel with the batten. Clipping shut prevents the tension adjustment from being lost (by accidentally rotating the white fitting.)

3. Release the cross-tube tension and swing the wings in a few feet.

4. Remove all the battens from the sail. Slide the battens out slowly, rather than as fast as possible, to prevent wear. If you want to de-rig quicker pull two battens slowly out one with each hand. Unzip and then rotate the washout batten towards the wing tip.

5. Bring the leading edges in further so they are near the side of the 'A' frame. Slide the keel padding onto the keel and up around the tension bolt and Velcro in place. Dismantle the 'A' frame and attach the 'A' frame padding around the bottom of the uprights. You may need to lift the keel slightly to get the uprights to pack neatly alongside one another. When packed, the side wires should emerge from the top of this packing and should not be kinked.

6. Bring the wing tips completely together. Now is a good time to unhook the top rear wires put the small sock on the kingpost and fold it forwards between the leading edges of the sail.

7. The sail should be carefully arranged alongside the glider and then rolled and tucked inside the Mylar of the leading edge. One side can be rolled and retained with a tie and tip sock while the other wing is being packed.

8. The battens can be stowed at the front of the glider between the leading edges with the curves over the nose section. Place the ties around the glider holding the leading edges neatly together. Place the glider bag over the glider and then turn the glider on its back.

9. Now check that the uprights are arranged neatly between the sail alongside the keel and that the wires are neat with no kinks or twists. When neat ties can be moved or placed at the top and bottom of the uprights.

10. Put the speed bar in the sail with one end in a tip sock. Any remaining ties should be put around the glider. Tuck the nose cone under the tie nearest the nose of the glider.

11. Zip up the bag and store the glider in a cool, dry and dark place. Always ensure that your glider is dry before storing. If damp, store with the bag open and endeavour to get the glider out to dry fully as soon as possible.

De-rigging the glider upright on the keel

This is useful in confined spaces or where the terrain is likely to cause soiling or damage to the sail. It is essentially the reverse of rigging the glider on the keel:

1. Put the glider on the ground, keel down and tail into wind. Remove the under surface battens. To unclip the top surface battens: unclip the white clip fitting by rotating it around the eyelet. Remove from the sail eyelet and then clip it back parallel with the batten. This prevents the tension adjustment from being lost and makes the battens easier to pack neatly. Unclip all the batten ends and including the compression struts.

3. With the glider still tensioned, unzip and swing the washout batten towards the tip. Remove a couple of outer battens, say 1 or 2 per side. Roll the wing tips and put on the tip socks. (This keeps the tips covered and protects them before they are lowered when the tension is released.)

4. Release the cross-tube tension and move the wings in slightly. Attach the tension bolt packing and pass the Velcro in front of the lower rear wires. The keel remains on the ground.

5. Remove the nose cone and release the lower nose wires.

6. Remove all remaining battens except the nose batten.

7. Release the kingpost and lay it down onto the sail and put the sock on.

8. Bring the wings closer together pulling the sail between the leading edge and keel so that it is all above the leading edge. Roll the sail carefully and tuck inside the leading edge. One side can be rolled and retained with a tie and tip sock while rolling the other.

9. If you intend to remove the nose batten do so now. Put all the battens into their batten bag.

10. The battens can be stowed at the front of the glider between the leading edges with the curves over the nose section. The ties can then be placed round the glider holding the leading edges neatly together. Remove the ties holding the sail in place and put them around the whole glider in the normal way.

11. Place the glider bag over the glider, turn the glider on its back and lay it on the ground.

12. Dismantle the 'A' frame. Attach the 'A' frame padding around the bottom of the uprights. When packed the side wires should emerge smoothly from the top of the packing.

13. Put the speed bar into its bag and store in the sail near the wing tip. Any remaining ties should be put around the glider. Tuck the nose cone under the tie nearest the nose of the glider.

14. Zip up the bag and store the glider dry in a cool, dry, dark place. Always ensure your glider is dry before storing.

TUNING INSTRUCTIONS

Trim speed

Adjusting trim speed is one of the most important basic adjustments to get right on a hang glider. Experienced pilots often overlook it. Always make sure that you get the trim speed right before any other changes are contemplated. Also having made any other changes always fly and re-adjust the trim speed, if necessary, before evaluating and making further changes.

What is trim speed?

The trim speed or pitch trim is the speed at which the glider flies with no pitch input from the pilot. It is not necessary to let go of the speed bar to establish trim. In fact a more realistic trim occurs with one holding the speed bar gently with no intentinal forward or aft input. (This might be slightly faster than hands off due to the weight of hands and arms on the speed bar.) Some pilots have 'heavy hands' or like to fly pulling in a bit all the time. This might happen if the pilot has recently come from flying very a very heavy pitch school glider. Pilots like this require a hang point might slightly rearwards. High speed flight will require more effort. Generally more experienced pilots will choose to trim the glider so that it flies comfortably with little or no input. With light hands on the speed bar the pilot can be more sensitive to other feedback from the air. In addition good trim makes the glider less tiring and higher speed flying alsos requires less effort. Triming too fast achieves very little and should be avoided.

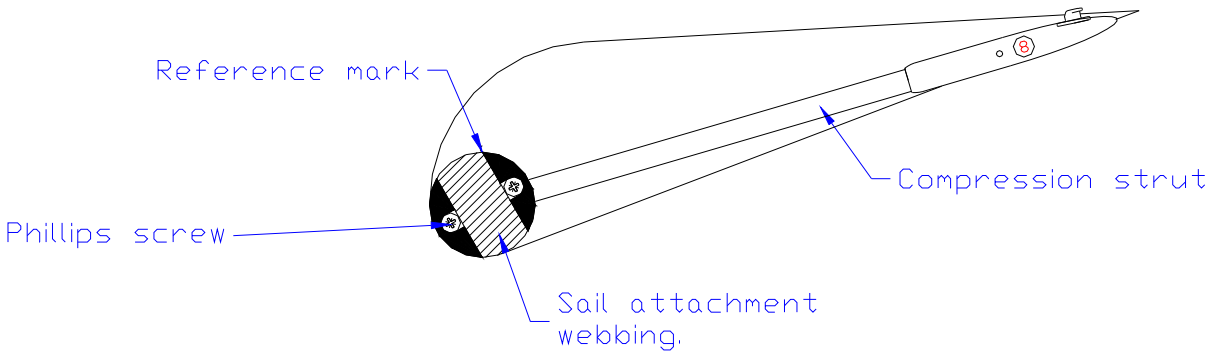
The glider should be trimmed (in pitch) to fly comfortably with no nodding tendency (too slow). It should turn comfortably in either direction. (If you have an ASI (Air Speed Indicator) it will probably show low 20s mph or mid 30s kmh when trimmed correctly.) Different payloads will alter the trim speed but different ASIs may give different readings with the same payload as well.

The trim speed is adjustable by moving the hang loop forwards or backwards along the keel. Forward movement will increase the trim speed of the glider (make it fly faster), whilst rearward movement will lower the trim speed. Only move the hang loops in small increments. (**5 mm maximum** between flights). You should not need to move the hang loop very far from the suggested starting position for comfortable flying. (Certainly not beyond the limits stated in operating limits on page 5. If in doubt contact Avian.)

Turns

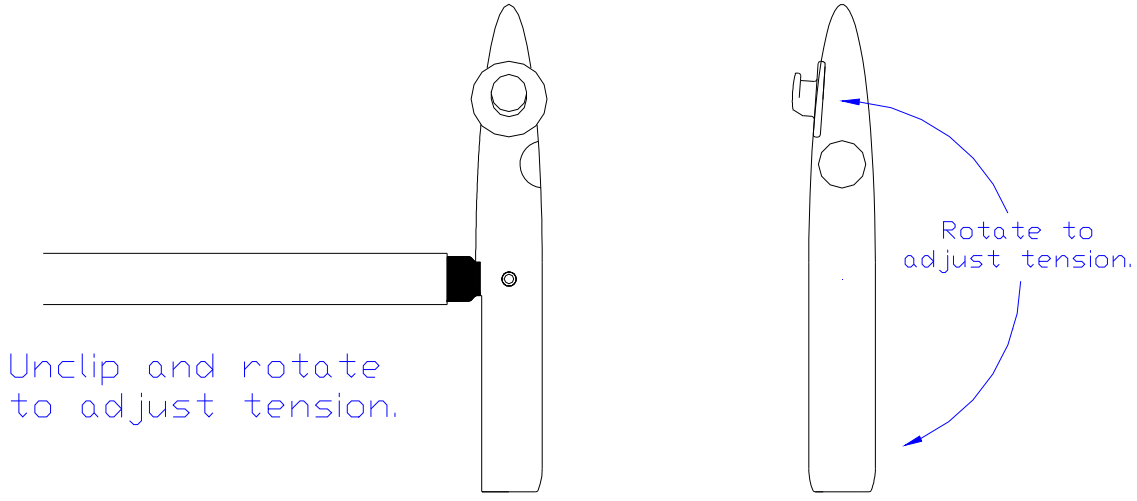
A turn in the Rio 2 is unusual. If your glider previously flew straight then the most likely explanation is that you have damaged your glider. If a turn is detected first check the battens. Check them against each other (making sure that they are the same on both sides) and then against the profile. Next check that the

batten tension is the same on both sides of the glider. If there is still a turn check that the leading edges are straight and undamaged.



A slight turn may be tuned out using the adjusting the tip cap. Before any adjustment is made locate the reference mark on the outer leading edge and note its position relative to the black plastic end-cap. If there is no reference mark on the leading edge, ensure that you mark the starting position of the end-cap before any alterations are made. To make an adjustment, loosen the 2 self-tapping screws no more than 3 turns and then rotate the black plastic cap slightly. It is possible that the screws may stand 'proud' of the end-cap when they have been unscrewed and you will need to exert sufficient pressure to push them inwards so that they are flush with the surround. (A tap on the end of the screwdriver is normally enough.) You should then be able to rotate the end cap and adjust the washout. The wing that is lifting should have the washout increased (*i.e.* trailing edge lifted) while the wing dropping should have the washout reduced (*i.e.* trailing edge lowered). **ONLY ALTER THE WASHOUT AT THE TIP IN SMALL INCREMENTS**. (MAXIMUM 5mm at a time.) The total movement should **NOT** exceed 15mm each side of the reference line. **DON'T FORGET TO TIGHTEN THE SELF-TAPPING SCREWS AFTER ADJUSTMENT** to lock the cap in the new position.

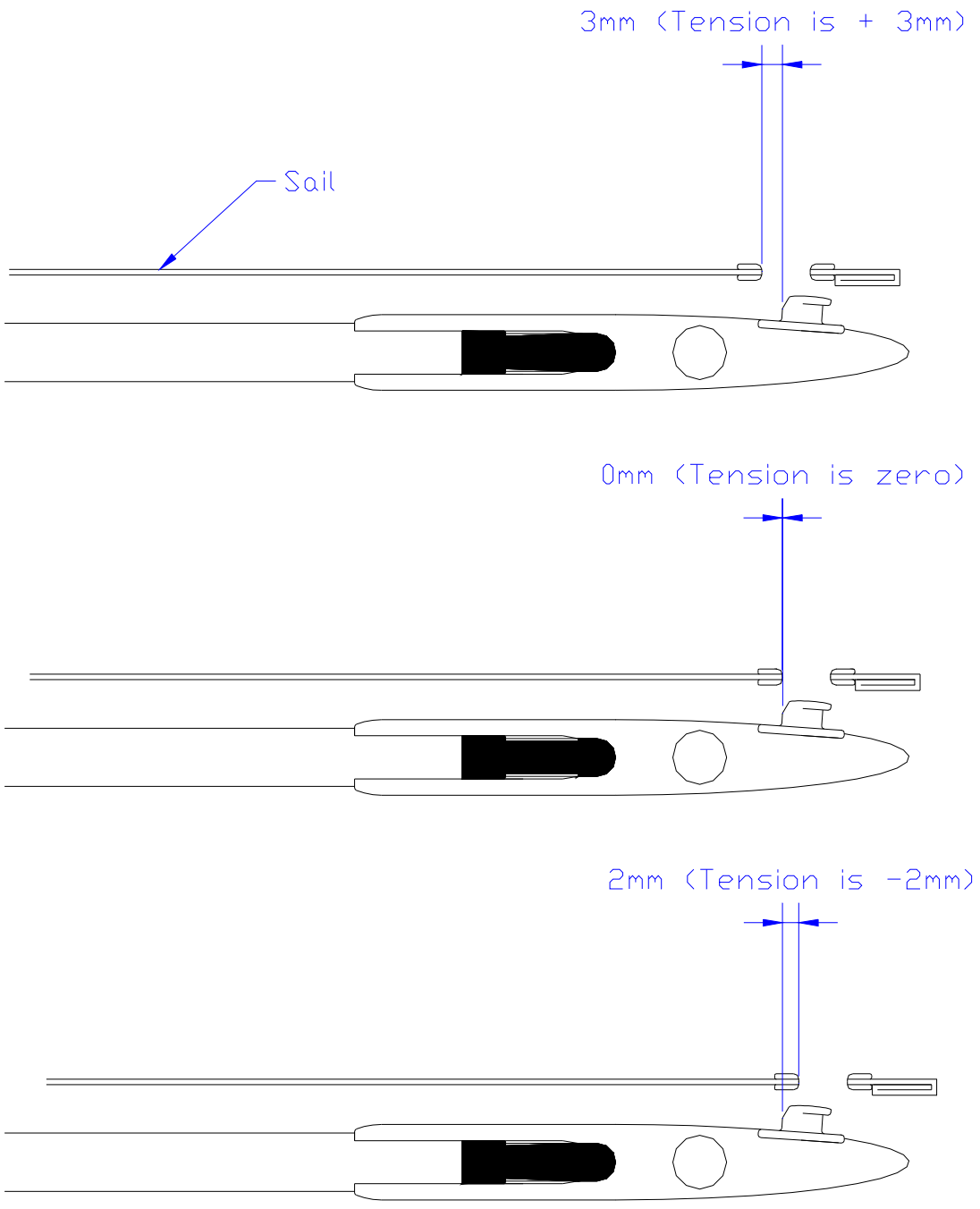
Batten Tensions



The Rio 2 battens are similar in design to those used in the high performance Cheetah and Evo competition gliders from Avian. The snap fitting allows neat robust fitting, easy rigging and easy precise adjustment of batten tension. The batten tension does make a difference to how the glider flies and is therefore important. The tension can be adjusted by rotating the clip end when open. One turn alters the tension by 1mm.

Checking Batten Tension

Batten tension should be checked with the glider fully rigged nil wind conditions. The batten tensions are checked with the glider tensioned but the VB fully off.
All battens should be clipped into their eyelets. To check the batten tension (of batten 1 for example) unclip the batten from the sail and then clip it shut below the sail. Looking from above and holding the trailing edge with light tension the current tension adjustment can be viewed from above as shown below. For ease the tension is expressed in mm displacement.



Recommended factory set up:

The battens are numbered from the root outboard. The batten closest to the keel is number 1.

Batten number 1 should be relatively tight.
Moving outboard battens 2 to 6, should be light tension. Too much tension makes the glider harder to turn. Batten 7, the washout batten, should be far tighter. This batten loosens in flight as the sail lifts so needs to be quite tight on the ground. The compression strut (8) should be tight like number 1 batten. Again too much tension makes the glider harder to turn.

Recommended Starting Batten Set-up.

Batten	1	2	3	4	5	6	WO (7)	8 Comp
Tension(mm)	3	0	0	0	0	0	7	3

Note: The battens are numbered from 1 at the keel to 6 near the tip. The outer most batten or compression strut is number 8.

Some blanks are left for you to record alternative tuning that you might prefer.

Washout Batten tension at the tips

The washout batten tension at the tips can be altered symmetrically. The tension on this batten appears to be far greater than the other battens when the glider is on the ground. (In flight the sail lifts at the tip and the tension is reduced.) Only small changes are needed and large changes are counterproductive. If you reduce the tension too much the sail will flutter in flight.

Asymmetrical tuning will also have an effect on turning.

Please note: The lower limit for washout is factory set (different adjustment) and should not be altered, if in doubt refer to your Avian dealer or contact the Avian factory. **Changing this setting may make the glider dangerous in pitch.** It should be noted that there is no flying benefit from winding in the washout batten adjuster at the inboard end of the washout batten or increasing the length of the washout support wires. In normal flight these wires are loose anyway.

Other tuning should NOT be carried out without reference to Avian Ltd., or an approved dealer.

BATTENS AND BATTEN PROFILE

The Rio 2 battens should be maintained in the correct profile. Failure to do this could result in adverse flying characteristics.

Batten Material

The nose batten is made from 1/2" OD 6082 T6 aluminium alloy tubing. This is relatively soft and easier to bend than the other battens. All other battens are made from 10.6mm OD 7075 T6 aluminium alloy tubing. 7075 is a harder stronger alloy than 6082, more difficult to bend and more brittle. However it holds its shape much better and therefore usually requires little correction if undamaged.

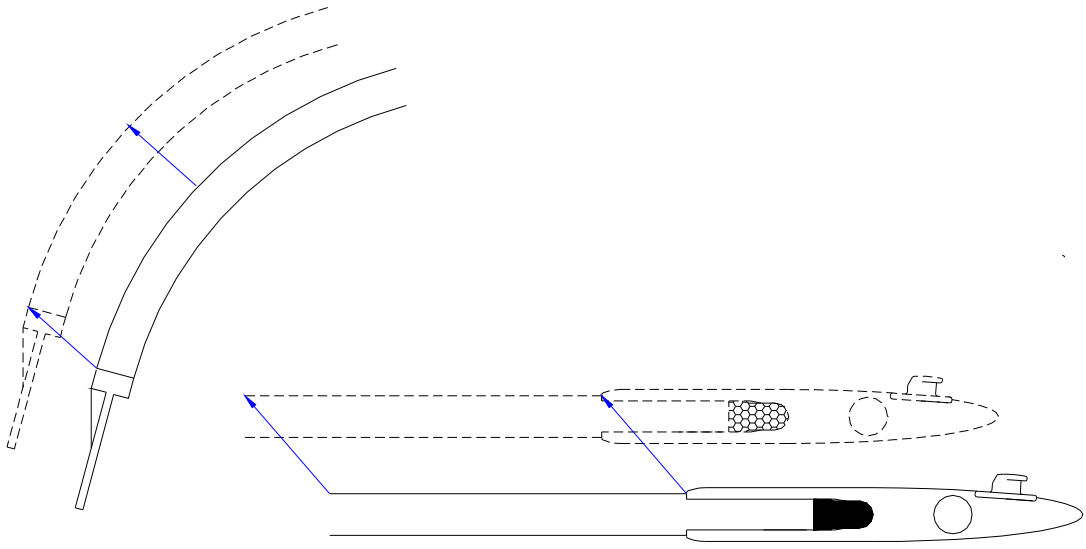
How often should your battens be checked?

Initially check your battens regularly, this will give you some idea of how fast they are changing profile and will bring to light any damage you might be doing to your battens in storage. Battens made from 7075 aluminium alloy tend to hold their shape well. As the nose batten is made from the softer alloy, 6082, it will tend to harden and hold its shape better once it has been re-profiled a few times. On the Rio 2 the batten most likely to require re-profiling is the nose batten.

Don't forget: If you don't know how the glider has been treated while it is out of your care (for instance if it has been sent by carrier or on an aeroplane) check the battens against the profile and do a very thorough pre-flight check **BEFORE** flying.

Batten Profile

The batten profile is printed with the profile or shape of the battens. The length of the battens may not exactly match the profile due to inaccuracies in the printing process.



Move the batten over the profile as shown above

Checking the profile

The best place to check the profile of your battens is at home on a flat surface. (It is very difficult to do on the hill with no flat surfaces and the wind blowing the paper profile away.)

The printed profile should be rolled out flat and a book placed at either end to hold it down. The battens can then be compared to the profile by laying them on the profile and viewing from above:

Place green (right) number 1 batten against number 1 on the profile. Place the front end of the batten against the profile and check that it matches the profile along its entire length. If it does not match the profile see where it deviates and adjust the batten accordingly in that area (see below.) Continue this process until the batten matches the profile. Repeat the procedure for red number 1 batten and check that both number 1 battens are exactly the same shape. It is more important that the battens are symmetrical than that they are a perfect copy of the profile. Asymmetrical battens could cause a turn in your glider.

Repeat for batten number 2 and so on until you have checked all the battens. Do not forget to check that the compression strut and the under surface battens are straight.

Nose batten

The nose batten profile should not be under-cambered but can be a little over-cambered because the cut of the sail will tend to flatten the batten if it is over-cambered. The objective with the nose batten is to get the sail to fit tightly around the nose area.

How to alter the shape of the batten

The aim is to get a smoothly curved batten but it is not quite as easy as it sounds. It is very difficult to bend the batten very close to its front end. Do not attempt to alter the profile over the first 3-5cm of the batten. If your battens need profiling practice with the softer 6082 nose batten first as it is much easier to bend.

To increase the curve in the batten hold the batten either side of where you want to increase the curve and run the batten over your knee or leg exerting a gentle pressure. (It helps if you are wearing something slippery.) Compare with the profile and repeat if necessary. Try to avoid point bends and make sure that the bends are all in the same plane. (Extra care should be taken when re-profiling any battens made from the harder 7075 aluminium alloy to avoid broken battens.) To reduce the curve, do the opposite of the above either over your knee or preferably by pressing on a flat surface. If you have a point bend try and remove it.

MAINTENANCE

Annual strip down and factory inspection

Avian recommend that the Rio 2 has a factory inspection every year or 100 flying hours which ever is the sooner. This is a sensible precaution, as some tube damage just cannot be seen with the sail on. An additional benefit of the strip down is that the latest upgrades can be fitted, sometimes free of charge.

General

Careful attention to the rigging and de-rigging sequence will reduce the risk of accidental damage. Repairs should only be undertaken by the Avian factory or an approved dealer using genuine Avian spares.

The correct storage of your glider will also greatly influence its life. The glider should always be stored:

- **well packed**
- **completely dry**
- **well supported**
- **in a dark, cool and dry place.**

Airframe Maintenance

Apart from damage caused by over stressing the glider *i.e.* crashing *etc*. the major wear and tear on the glider occurs in transit.

Aluminium Tubing

Care and consideration in de-rigging and transportation will pay dividends in airframe life. Damage to any one of the structural members is serious and the only remedy is replacement. Insufficient care during ground handling or transportation can lead to tube abrasion or indentation. The former accelerates fatigue

fracture and the latter reduces the strength of a component. Keep a regular watch for telltale hairline cracks, which are most likely to occur in high stress areas such as around boltholes. If you bend, dent or damage the tubular members in any way, seek immediate professional advice before flying again and have replacement parts fitted.

Fasteners

Any fasteners (*i.e.* nuts, bolts *etc*.) that are bent or show signs of wear or corrosion should be replaced immediately. Nyloc nuts should only be used ONCE. One clear thread of the bolt should stick out beyond the end of the Nyloc. Nuts should be tightened only so that they are snug. In most applications on a hang glider the nut is only there to stop the bolt from falling out. DO NOT OVER-TIGHTEN NUTS AND BOLTS. Over-tightening can crush the tubes and damage the hang glider.

Rigging Cables

The main danger with the rigging lies in kinking the cable. This is usually caused by careless rigging and de-rigging or by over tightening the bolts that attach the tangs to the airframe. (It should be possible to swivel the tangs with light thumb pressure.) Once a cable has a kink the strands are damaged and replacement is the only cure. The side cables are particularly important and should receive a frequent detailed inspection. Check for cable damage along the length paying special attention to the area immediately adjacent to the swaged fitting, as this is the main failure area. Look carefully for signs of strand fracture at this position. Corrosion shows itself initially as white powdery deposit. Very serious corrosion of wires is brown rust coloured. Corrosion cannot be cured and the only answer is replacement. Even apparently undamaged rigging wires should be replaced every 100 hours.

Cross-tube tensioner

The stitching on the cross-tube tensioner is easy to see and should be inspected frequently. The rest of the tensioner strop is hidden in the sail and keel pocket so that any damage is more difficult to see. Take time to inspect this area thoroughly, particularly the cross-tube centre junction, also ensure the shackle bolt is tight. If the strop is damaged (*e.g*. fraying, abrasions, cuts or wear to the stitching) replace it before flying.

Wing fabric maintenance

Any cuts or tears at critical areas such as the trailing edge, sail fixing points or similar high load areas, must be repaired at either the Avian factory or an Avian approved workshop. Small damage to panels, leading edge covers *etc*., can be repaired with proprietary self adhesive tape. 'Small damage' is defined as abraded holes no more than 10mm diameter and small cuts no longer than 15mm. Anything larger should be inspected by Avian approved personnel.

Stitching Damage

Thread damage never gets better and eventually runs. If you abrade a seam or damage the stitching in any way, have the damage repaired before it gets worse. Small, non load-bearing areas can often be repaired *in situ* by the tedious but effective method of hand sewing back through the original stitch holes. Use a needle and only the correct polyester thread: available from Avian or a good sail maker.

Wing-fabric cleaning

It is, without doubt, better to keep the wing clean than to try and clean it. If a sail becomes dirty some stains will never come off. With a new glider avoid getting it dirty in the first place by careful rigging and de-rigging. If you decide you do need to wash your wing, then select a dry day and have access to a good hose and clean water supply. Never use bleaches, strong soaps or detergents, the soap residue can react

with ultra violet light and degrade the fabric. We recommend a very mild liquid soap (washing-up liquid) and a soft sponge. Gently wash the fully rigged wing, frequently hosing clean. Copious amounts of clean water will not harm the wing and can be very beneficial in removing sand and grit which may get trapped inside the sail (usually in the nose or wing tip areas.) Removing stains from stitching is difficult; resist the temptation to scrub with a stiff brush as it may do more harm than good. Ensure that the wing is completely dry before de-rigging and storing.

Battens

Battens form the wing shape and substantially influence the performance of the wing and need to be treated with care. As they are subject to constant stress both during flight and rigging they may lose their shape and it is therefore essential that they are checked against the template at frequent intervals and re-profiled if necessary. (See Section: Battens and Batten profile.)

PITCH STABILITY

What is pitch stability?

Pitch stability is the tendency for the glider to maintain a steady angle of attack if disturbed. It is unusual to fly in perfectly smooth air. In fact glider pilots often seek out rough air in the form of thermal lift. When the glider flies through rough air or turbulence the glider will try and return to normal flight if the pilot keeps the same position. Of course often the pilot might help and pull in if the turbulence lifts the nose of the glider. (Pulling in turbulence is a good idea as an aircraft is more stable with its centre of gravity moved forwards.)

Pitch stability is very important for most aircraft as it makes them easier to fly. Pitch stability is especially important for hang gliders as the aircraft is controlled via weight shift. If the glider encounters turbulence that makes the pilot weightless then the pilot is temporarily unable to influence the glider. In these situations the pitch stability of the glider is vital as the aircraft essentially flies its self for a moment. If there was insufficient pitch stability then the glider might not recover and tumble.

Violent turbulence is quite rare, as hang gliders are not generally flown in very bad weather.

What gives pitch stability?

The Rio 2 has two main pitch stability devices:

- The anti luff lines (Reflex)
- The washout battens. (Washout)

The 'luff lines work by holding up the rear of the sail in weightless situations or when the angle of attack is said to be very low or negative. This gives the part of the sail to which luff lines are attached a curved up rear or 'reflexed' section. Reflexed sections are stable and tend to bring the nose of the glider up. 'Luff lines work very well especially at high speeds.

The 'washout battens' or washout limiting rods (sometimes called sprogs) set the lower limit of the washout of the hang glider. Washout is the twist up of the trailing edge of the wing at the tip. Washout happens in normal flight of a flex wing hang glider even without washout rods. What the washout rod does is set the lower limit for washout. If the glider is subjected to turbulence that tries to twist the trailing edge of the wing tips down the washout rod resists downwards twisting beyond a certain limit.

Washout when combined with the sweep of the hang glider causes the wing tip to act in a very similar manner to the tail plane of a conventional aircraft. That is if the nose is too high and the centre section of the wing is stalled the wing tips continue to fly due to their lower angle of attack. This will end up with the nose dropping and normal flight resumed. A similar but opposite effect happens at low (for centre section) or negative angles of attack for the tip. This time the resultant moment is nose up.
Washout rods work especially well at low speeds.

The combination of these two pitch stability devices makes the Rio 2 perform very well in pitch stability.

Checking pitch stability set up.

It can be seen that the pitch stability of a hang glider is very important. What makes it perhaps more important to keep set correctly is the fact that in normal flight it is often impossible to tell if the pitch stability of the glider is set correctly. In fact sadly quite a few competition pilots have died due to changing their gliders. They reduced or eliminated the pitch stability of their gliders in the belief that they would gain a small performance advantage. In normal flight their glider probably felt similar and flew in a similar manner. It was only when they encountered a bit of turbulence that tipped the glider too far that the lack of pitch stability became apparent with violent consequences.

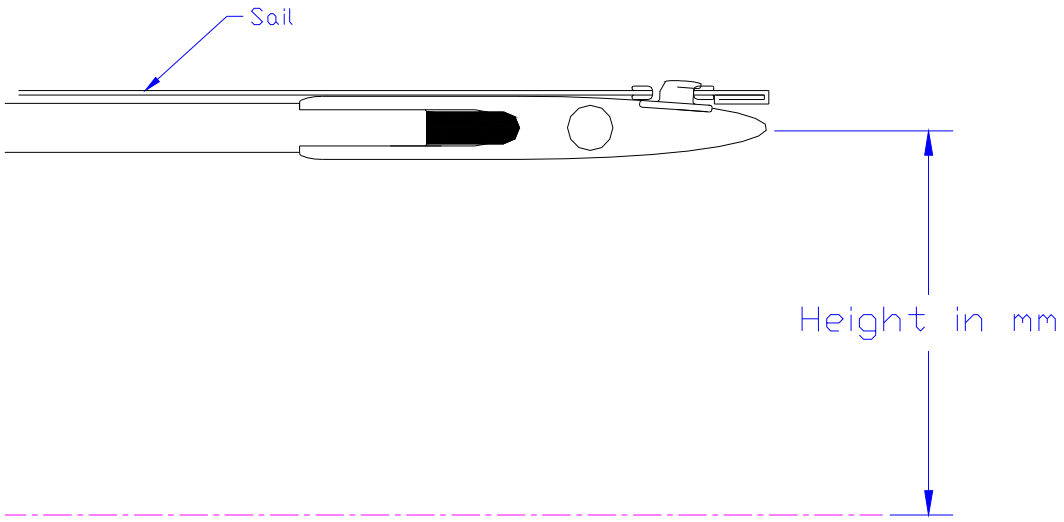
The problem for these pilots is that with a competition glider changing these settings can initially give a small performance advantage but can massively reduce safety. The pilots can't detect the increased danger until it's too late.

On the Rio 2 there is no performance advantage that can be gained through changing pitch stability settings so make sure they are within the specified limits and don't move outside those limits.

Clearly if any components connected to washout are replaced, (for example an outer leading edge) it is vital to set up the washout to factory settings before flight. In addition as a hang glider is used most wear results in a reduction in pitch stability settings. It is for this reason that checking the pitch stability settings is a good idea every 100 hours of flight. (See annual inspection below.)

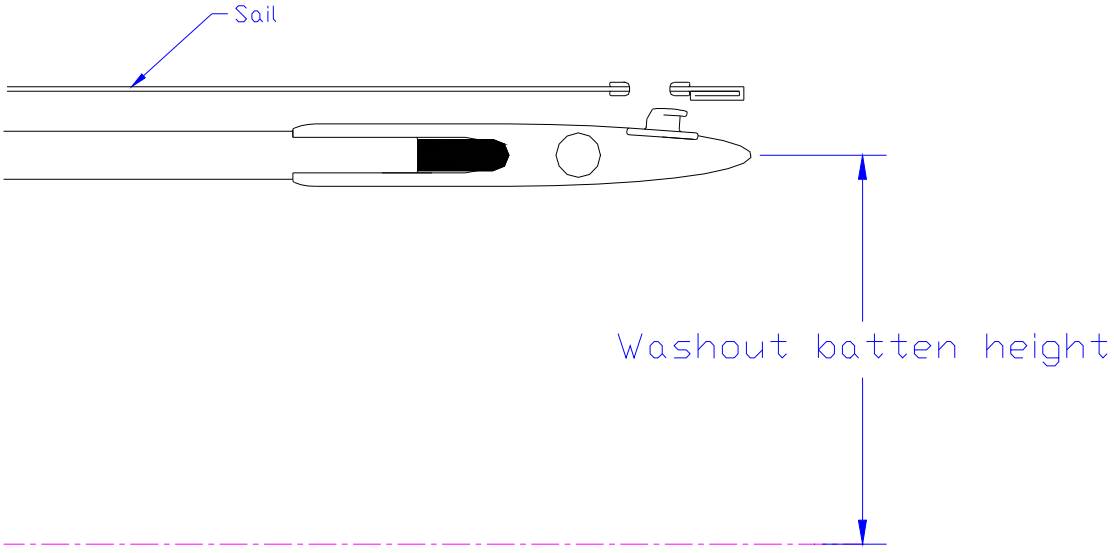
How to check.

The easiest and quickest way to check both pitch stability systems is to rig the glider inside on a flat surface. The battens should be checked against the profile before rigging the glider. Lay the glider flat on the floor with speed bar attached but nothing else under the keel or leading edges. With a ruler measure the heights above the ground to the centre of the batten ends.

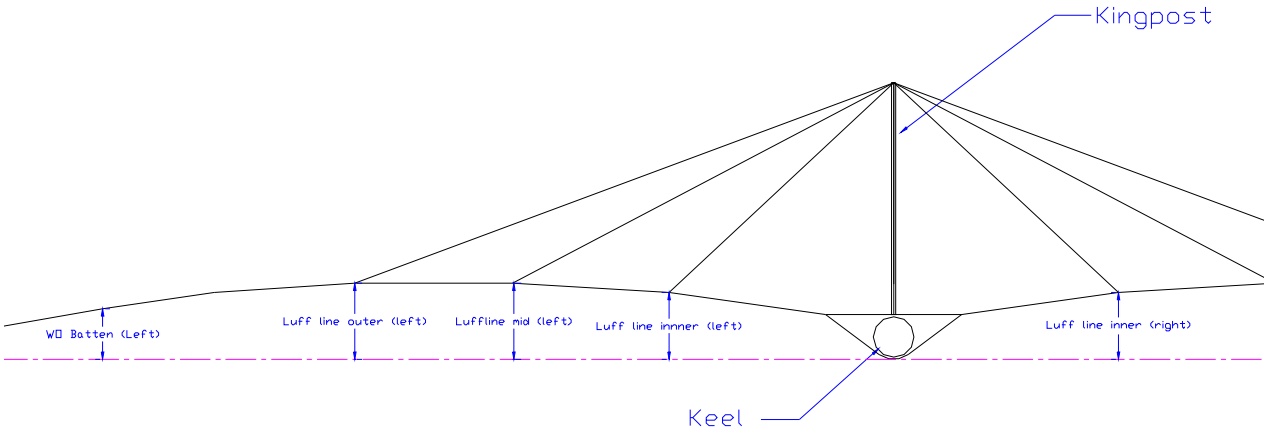


How to measure washout batten heights.

The washout battens must be measured in a special way. Prior to measuring the batten end must be unclipped from the sail but left below the eyelet. This is important as the tension in the sail causes the washout batten to appear higher than they do supported by their support wires. It is the height with the support wires tight that is to be measured.



By walking behind the glider all the measurements can be recorded and written down (make sure the keel is central):



	Left Wing				Right Wing			
	WO batten	Luff (outer)	Luff (mid)	Luff (inner)	Luff (inner)	Luff (mid)	Luff (outer)	WO batten
Max	180	195	190	160	160	190	195	180
Nominal	**175**	**175**	**180**	**150**	**150**	**180**	**175**	**175**
Min	160	165	170	140	140	170	165	160

As well as being simple the above method has the advantage of enabling the symmetry of the glider to be checked. This is especially useful with the washout rods. It is possible to set different heights on each side. They should of course be set symmetrically.

REPAIR

The Rio 2 airframe is deceptively simple, but like all aircraft requires skilled and qualified attention. We do not recommend self-repair or re-assembly by other than Avian or Avian nominated repair agents. No replacement parts should be fitted unless they are factory supplied and identified as such. When ordering spares always quote your glider serial number (make a note of it if you have to replace your keel. It should be recorded on the front of this manual). Bent aluminium tubes must never be straightened, always replaced. Frayed cables and cables with damaged or twisted thimbles must always be replaced. If you feel you must take your glider to pieces then take many detail photographs prior to disassembly, order new nyloc nuts and locking compound for reassembly.

To help you identify components some of the main assemblies are shown in the appendix of this manual.

RECOMMENDED COMPONENT LIFE

The safe working life of the structural components of the Rio 2 is dictated by the environment in which the aircraft is used and the care taken during day-to-day operations. Inspection, therefore, is an essential tool in deciding the continued use of most components, particularly the sail. UV exposure shortens the life of the sail, so it should not be left needlessly exposed to sunlight or any other source of UV radiation. Due to the nature of their material, construction and position within the structure, certain components have a critical fatigue life and it is mandatory that these components be replaced within the time stated below.

Cross-tubes	1000 hours
Leading Edges	1000 hours
Control frame / fittings	1000 hours
Keel	1000 hours
Tension strop	300 hours

Rigging wires	100 hours
Factory inspection	100 hours or 1 year (see maintenance)

TRANSPORTATION BY CAR

The wing must always be transported inside its bag, well packed and with all the protective padding in place. The zip on the bag can be placed underneath to reduce entry of rainwater. During transportation, or when stored on slings, the wing must be supported at its centre and at two points not more than one metre from each end. Supports should be padded and relative movement between glider and supports must be avoided at all times. (If travelling abroad pay attention to the legal requirements for both glider overhang and coloured flags *etc*.)

SHORT PACKING

It is sometimes useful to short pack your glider especially for transportation by air. It is unusual to be able to take the glider full length on an aeroplane and is always best to short pack it.

Tools:

You should require no tools to short pack a Rio 2. However, depending upon the leading edge tension and your experience you might require a large Phillips screwdriver.

The Rio 2 leading edge has been specially designed in two main sections, the inner (nose to outboard of the cross-tube/leading edge junction) and the outer (tip section of the leading edge). These sections can be separated for short packing - useful for transport overseas or storage.

Removal of the outer leading edge

The outer leading edge section slides inside the inner leading edge and locates on a clevis pin, which stops it rotating. The outer section can be removed without removing the clevis pin. Do not remove this 'locator' clevis pin. (The outer leading edges **MUST** be replaced in the correct sides of the glider. See: **Assembly Drawings** at the back of this book.)

If you have a Rio 2 17 with a detachable keel and want to reduce the packed length to the absolute minimum you may reduce the length of the inner leading edge by removing the clevis pins on the leading edge tubes near the nose. With these removed it is possible to telescope the inner leading edges (We recommend that you **do not** undertake this procedure unless you need to short pack less than 12'. Re-assembly is more difficult.)

To remove the outer section of leading edge:

1. Unzip the glider bag and remove the sail ties. Sit down at the wing tips and holding the leading edge inside the sail with one hand pull the webbing loop at the end of the leading edge. The sail can be disconnected from the wing tips by pulling and slipping off the webbing straps from around the end caps. (Do **not** loosen the screws in the tip caps.) This procedure requires no tools but is quite difficult to do, especially for the first time on a new glider. New gliders have tight sail tension along the leading edge. Once you have mastered the technique it becomes far easier.
If you are unable to pull enough tension to release the webbing then the job can be made easier by releasing the leading edge tension at the nose by unscrewing the cross-headed, self-tapping screws at the **NOSE**. This reduces all the tension in the leading edge so the webbing now falls off. Once the webbing is removed put the nose screws back in their holes through the sail taking care not to cross the threads.

2. Before moving the outer leading edges mark them 'left' and 'right' with a felt pen. The leading edge outer can now be pulled out of the sail carefully. The washout battens will need to be carefully rotated to pass through the zip hole in the sail as the outer leading edges are removed.

3. Remove the leading edges and place a padded bag over the end of the inner leading edge to prevent it damaging the sail.

4. Place a cylindrical object (cardboard roll 4" diameter, roll of bubble wrap or plastic bottle *etc*.) alongside the sail and bend the tips round. (Take care not to crease the Mylar or damage the sail on the end of the inner leading edge or by bending it round too sharply.)

5. Wrap and pack the leading edge outer leading edges so that they will not damage your sail or each other.

Re-assembly of the glider

This is basically the reverse of removal of the leading edges:

1. Open the sail out and remove padding from the end of the inner leading edge.

2. IMPORTANT: Check that you have your outer leading edges in the correct sides. (CHECK THE MARKS THAT YOU PUT ON THEM) When the glider is rigged the washout rod support should be sticking upwards and the washout batten towards the trailing edge. (See: **Assembly Drawings** at the back of this book.)

3. Rotate the washout batten towards the inner end of the outer leading edge and **s**lide the outer leading edge into the sail from the tip. Thread the washout batten through the zip hole in the sail and rotate it towards the trailing edge and then wing tip as you feed the leading edge into the sail. The outer leading edge should be inserted in the open end of the inner. This is easier if a small object like a bag is placed under the inner leading edge to lift it slightly off the ground. When almost home the leading edge should be twisted slightly until the slot engages with the clevis pin. It should then be pushed fully in. You should hear a 'clonk' when you push it fully home. You should no longer be able to rotate the outer leading edge if correctly assembled.

4. Look into the sail from the tip. Check that the leading edge outer is in the correct side and that the washout batten is correctly threaded through the zip hole.

5. Sit at the end of the leading edge and while holding the leading edge with one hand pull the webbing tight and slip over the end of the tube so that it locates in the slot of the end cap. This is easier if all ties are removed from the glider and if somebody lifts the leading edge of the sail so that the fabric is able to lie tight along the aluminium leading edge. Ensure that the sail webbing is correctly seated into the end-cap groove at the wing tips. If you are unable to pull the tension on then this can be made easier by removing the screws at the nose end of the sail. However the glider will then need to be fully rigged to replace the screws.

6. Rig the glider as per this manual. If the nose screws have been removed, **TAKE GREAT CARE TO PULL THE SAIL TOWARDS THE NOSE WHEN OPENING THE WINGS OUT. THIS IS ESSENTIAL! FAILURE TO DO SO WILL RESULT IN VERY SERIOUS SAIL DAMAGE.** Move the wings out a little, then go to the nose and pull the sail forwards. Move the wings out a little further and pull the sail forwards at the nose again. Repeat until the wings are fully opened.

7. When fully rigged the tapping screws at the nose can be replaced. The holes should line up. If not, thread a thin cord through the holes, pull the sail into position, replace the screws and remove the cord.

8. In your pre-flight check, check all the fasteners especially those that have been removed and make sure the webbing at the tip is correctly seated in the slot in the tube cap. Make sure that the outer leading edges are inserted in the correct sides. The washout rod supports on the leading edge should stick upwards towards the top surface of the sail.

TRANSPORTATION BY AIR

Remember, your glider has to be loaded on and off the plane and get past the baggage handlers at both airports. It also has to make the return journey.

The object is to:

- Make the glider as short as possible.
- Protect the glider so that it will not get damaged in transit.
- Make the package as light as possible with handles so it is easy for the baggage handlers to move. (If they can't lift it they'll probably use a forklift truck.)
- Minimise the damage to the sail caused by packing the glider.
- Make the whole operation simple, so that you can easily repeat the procedure for your trip home.

The type of damage you are trying to protect against:

- Damage caused by dragging one end of the glider across the floor. Protect the ends with thick cardboard or something that will not wear through too quickly.
- Damage to the glider from being dropped onto an edge such as a railing or the edge of a container truck. (If the whole package has some padding this helps prevent damage. Bubble wrap seems to help but is difficult to unpack and re-pack. You will need lots of sticky tape including some for the return journey.)
- Dirt: Airports and Aircraft-holds seem to be dirty places. If you've got a nice clean glider bag it won't be after a trip on the plane, so if possible use an old glider bag or some other suitable covering.
- Finally, a cover that shows damage is useful i.e. if you pack your glider in a cardboard box and somebody drives a 747 over it at least you'll be able to see the tyre marks on the box and look out for damage inside!

If you are lucky you may have a purpose made box or bag. (Avian make, and recommend an armoured short-pack glider bag.) This will speed-up the process of short packing and also provides good protection for your glider.

STORAGE

The correct storage of your glider will greatly influence its life. The glider should always be stored:

- **well packed**
- **completely dry**
- **well supported**
- **in a dark, cool and dry place.**

Ensuring that your glider is stored dry is important. The sail is made from anti-mould treated cloth but extended storage whilst wet might nevertheless encourage mildew. Wet storage will also greatly encourage corrosion of the airframe wires and fasteners. Salt water will of course be many times more damaging. After flying on the coast the glider should be washed with fresh water. If the glider is wet, leave the bag open and try and open out the glider to dry properly as soon as possible. It is important to keep the glider out of the sun when not in use as exposure to UV radiation damages the sail. Always try and store your glider inside. Use the thick bag supplied and if at all possible store in the dark.

TROUBLE SHOOTING

It is difficult to open the wings when rigging

When rigging the glider especially on the uprights without the nose batten in place it is possible to get the kingpost caught behind the cross tubes. This is an additional reason to leave the nose batten in when de-rigging. In flat rigging make putting the kingpost up one of your first operations and this problem will be avoided.

The tension strop gets caught

When rigging the glider and spreading the wings the tension strop should appear through the keel-pocket. If it does not, stop and check to see where it is caught rather than force it. Check for any damage to the tension strop before flying. To stop this getting caught again, make sure that the elastic attached to the strop is tight enough so that the cord disappears into the keel when fully rigged. Also check that the strop has no twists in it and that the cord loop is on the outside of the stainless tang (*i.e.* not next to the keel) when the tension is released.

The tension strop is difficult to pull on

1. The tension strop might be twisted around the cross-tube centre junction. When freed, inspect the strop for damage and replace if necessary. Try and keep the strop twist free.

2. You are flat rigging in a depression in the ground with the wing tips higher than the keel. Either lift the keel while pulling the tension on or move to a flatter area.

3. The side wire is caught:

a) The side wire is caught behind a batten end or wrapped around the control frame: release the wire, check for damage and replace if necessary.
b) The side wire is twisted at the junction with the leading edge, (the wire is kinked over the tang): release the wire, check for damage and replace if necessary. (This kinking is more likely if the tang is very loose. Check the nut has not come loose (**Deadly**). The wing wire nuts should always be new and for double protection locked with a tread locking compound. The nut should be tight enough so that the tang offers some resistance to movement with light thumb pressure but it should not be over tight. The resistance to working loose is provided by the Nyloc locking of the nut and the locking compound. Over tightening bolts can damage tubes.)

The wings are difficult to close when de-rigging the glider

1. When de-rigging on the keel the weight of the wings is transferred to the keel, this stops the cross-tube junction from sliding so easily on the keel when the tension is released (see above.) The easy remedy is to unzip the under surface and pull the cross-tube junction forwards. The wings can then easily be moved inwards.

2. When the tension strop is released it should be pushed towards the keel pocket to feed some slack into it, this allows the wings to move together more easily. It is possible for the tension strop to get caught. If this happens, find the obstruction and release the tension strop then continue to move the wings inboard.

The glider has a turn

Check for crash damage then see tuning instructions.

The glider has become more difficult to turn

1. This can be caused by an incorrect but symmetrical batten profile. (Asymmetrical battens tend to cause turns.) The glider handling will deteriorate significantly if battens are out of profile. Check the battens (don't forget the nose batten) against the profile more regularly.

2. This may also be caused by an incorrect trim position (the position of the hang loop.) The glider might be trimmed too slow "hands off" and be flying in a semi-stalled condition. See tuning instructions.

3. This can also be caused by foreign bodies in the cross-tube junction area. Check, and if present remove.

The glider is heavy or "strange" in pitch

The glider is heavy or handling badly despite the hang point apparently being in the correct position. The backup hang loop might be caught in such a way that it interferes with the main loop when moving the bar (in or out depending on the position of the backup loop relative to the main loop). Free the backup loop so that it is loose at any flying speed. Always fly with a backup loop.

The glider appears to be trimmed too fast despite having the hang loop at its furthest rearward position

1. If you are new to the glider and have previously flown a glider that had a heavier pitch response you may actually be pulling the bar in without realising. On a smooth day, when you have a safe ground clearance and are clear of all other aircraft, slowly release your grip on the base bar and check the bar position and trim speed without putting any load on the speed bar.

2. As above, this might also be caused by a backup loop that is caught and interfering with the main loop when flying. Free the loop so that you are sure it is loose in flight.

The short under surface batten has been put in the long under surface batten pocket

You can sometimes do this accidentally if rigging quickly. If you have pushed the batten in a long way, you may have to totally de-rig to remove it.

In future always work in from the tip with the under surface battens *i.e.* put the shorter battens in first. In this way if you get the wrong batten it will be too long and easy to remove from the pocket.

The nose cone is lost

YOU SHOULD NEVER FLY WITHOUT A NOSE CONE. Check that the nose cone is not down the leading edge pocket of the glider. Hold the leading edge up to the light and look for the silhouette of the nose cone.

The leading edge pocket appears to have black marks or other dirt on the inside

This is usually grass or other debris that has found its way into the leading edge pocket. Try and remove any debris as best you can. The problem is usually caused by storing the battens in the leading edge pocket, which tends to fill the pockets with debris and encourages mildew. **DO NOT STORE YOUR BATTENS OR NOSE CONE IN THE LEADING EDGE POCKET.**

OWNERSHIP

Please notify Avian Ltd. of change of ownership and change of address. This is important so we can let you know about upgrades or in the unlikely event, recall components or gliders.

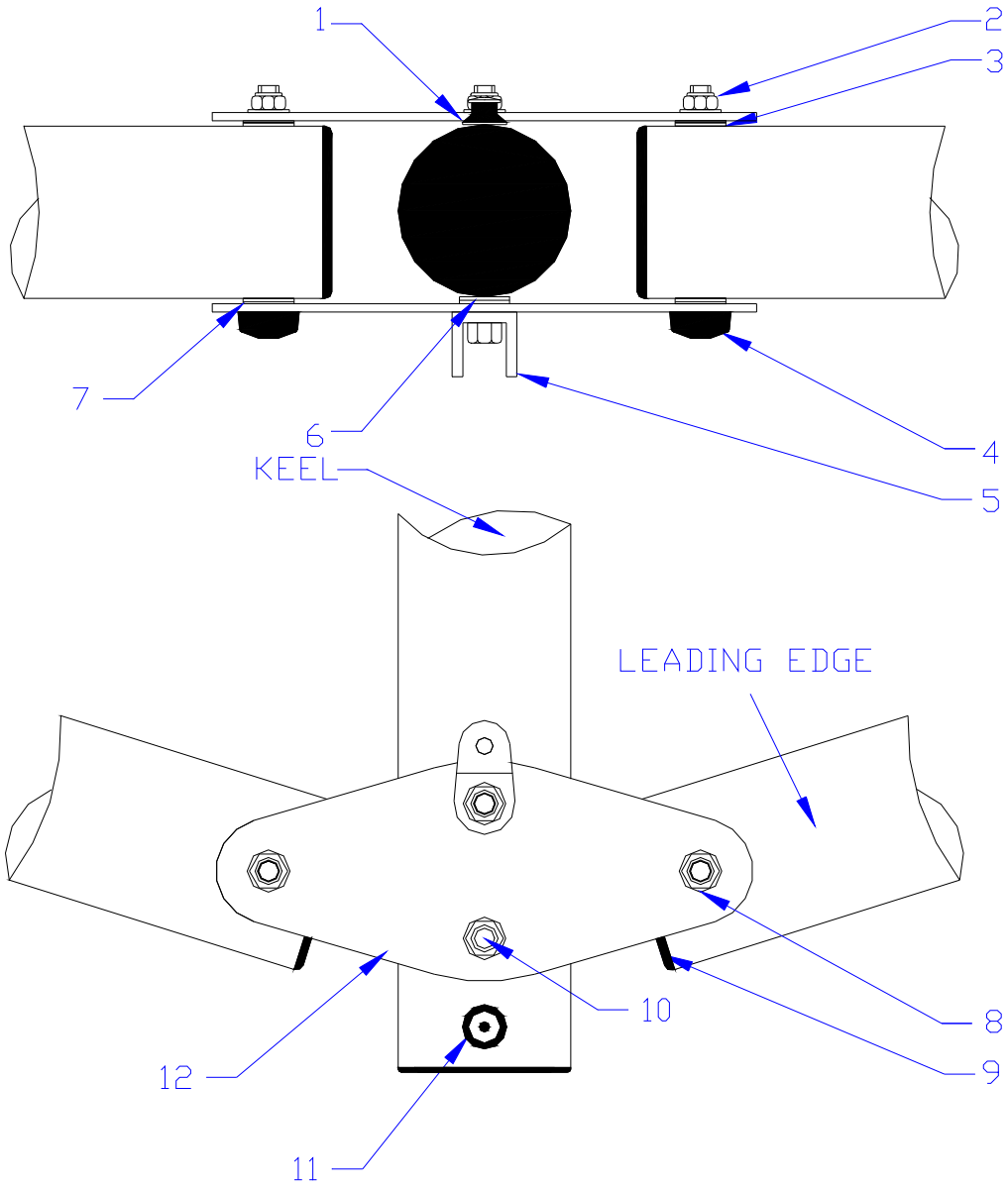
- Please keep a record of all work done on your hang glider.
- Please let us know of any ideas for changes that you think would improve our handbook, hang gliders or service. We are interested and would also like to hear if you have any complaints about the gliders or our service.
- We would be most grateful to receive any interesting photographs of our gliders.

Appendix

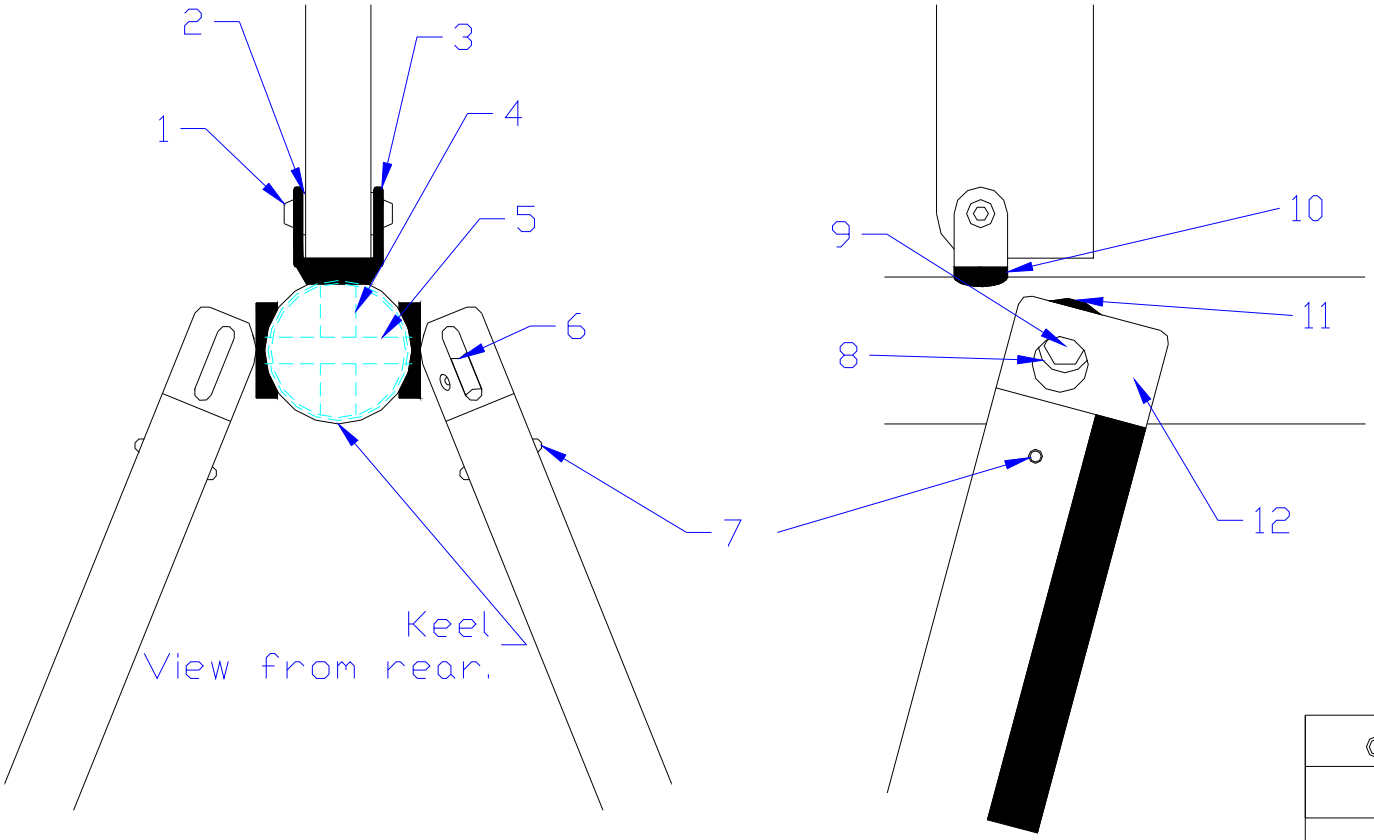
SPECIFICATIONS

Glider		**Rio 2 17**	**Rio 2 17**
		Imperial	Metric
Wing span		33ft 1 ½ inch	10.1m
Wing area		180 square feet	17 m2
Aspect ratio		6:1	
Normal packed length		19ft 11inch	6.08m
Quick short pack length		13ft 2inch	4.0m
Short pack length		12ft	3.66m
Glider weight rigged		66lb	30kg
Glider weight in bag		70lb	32kg
Min sink rate*		190 ft/min	1 m/s
Max. L/D ratio		11	
Speed range**		15-50 mph	24 - 80 kmh
Max. speed (VNE)		50 mph	80 kmh
*At a wing loading of		1.4 lb./ft^2	6.9kg/m^2

**Speeds measured using upright mounted vario-ASI system.
VNE: Velocity Never Exceed.



PARTS LIST		
1	Single nylon washer	6
2	M6 Nylock nut	4
3	Aluminium insert	4
4	6mm Nut cap	2
5	Nose channel	1
6	Double nylon washer	
7	0.3mm Mylar washer	4
8	6mm Stainless washer	4
9	50mm Tube bung	3
10	6mm Diameter bolt	4
11	Batten location	1
12	Nose plate	2



PARTS LIST	
1	10mm M6 b'tn head screw
2	M8 Nylon washer
3	Kingpost channel
4	1/2" ⌀D Aluminium bush
5	3/8" ⌀D Stainless bush
6	VB Pulley and bearing
7	Double button spring pin
8	20mm Plastic Hemisphere
9	M8 Top upright bolt
10	Small Saddle
11	2 1/8"*1/4" large saddle
12	LH Top upright fitting

avian 2Rio17

Top of Uprights

MATERIAL

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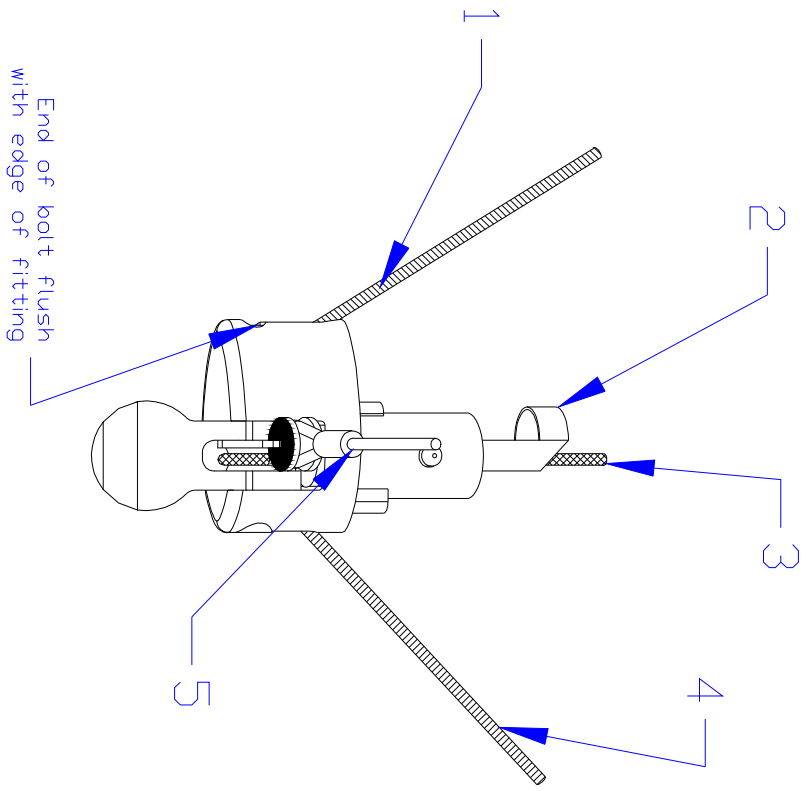
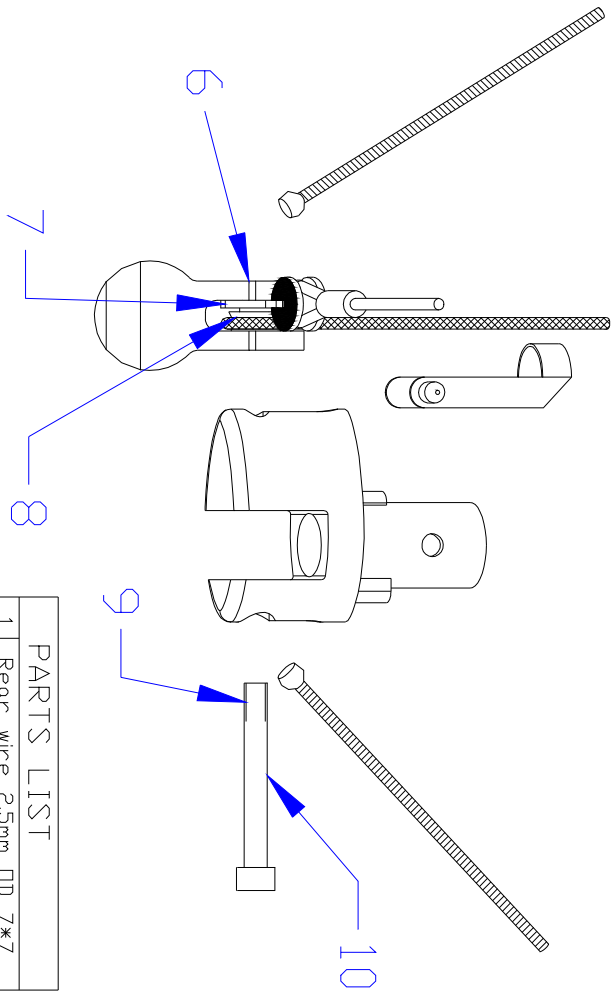
MASS (g)





PARTS LIST	
1	Rear wire 2.5mm OD 7*7
2	Double button spring
3	3mm VB cord
4	Front wire 2.5mm OD 7*7
5	Side wire 3.3mm OD 7*19
6	Bush for tang & pulley
7	Side wire (aft)
8	VB Pulley (fore)
9	Loctite 242 (Blue)
10	M6 * 48mm Cap Screw

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2Rio17

Control Frame Corner

MATERIAL

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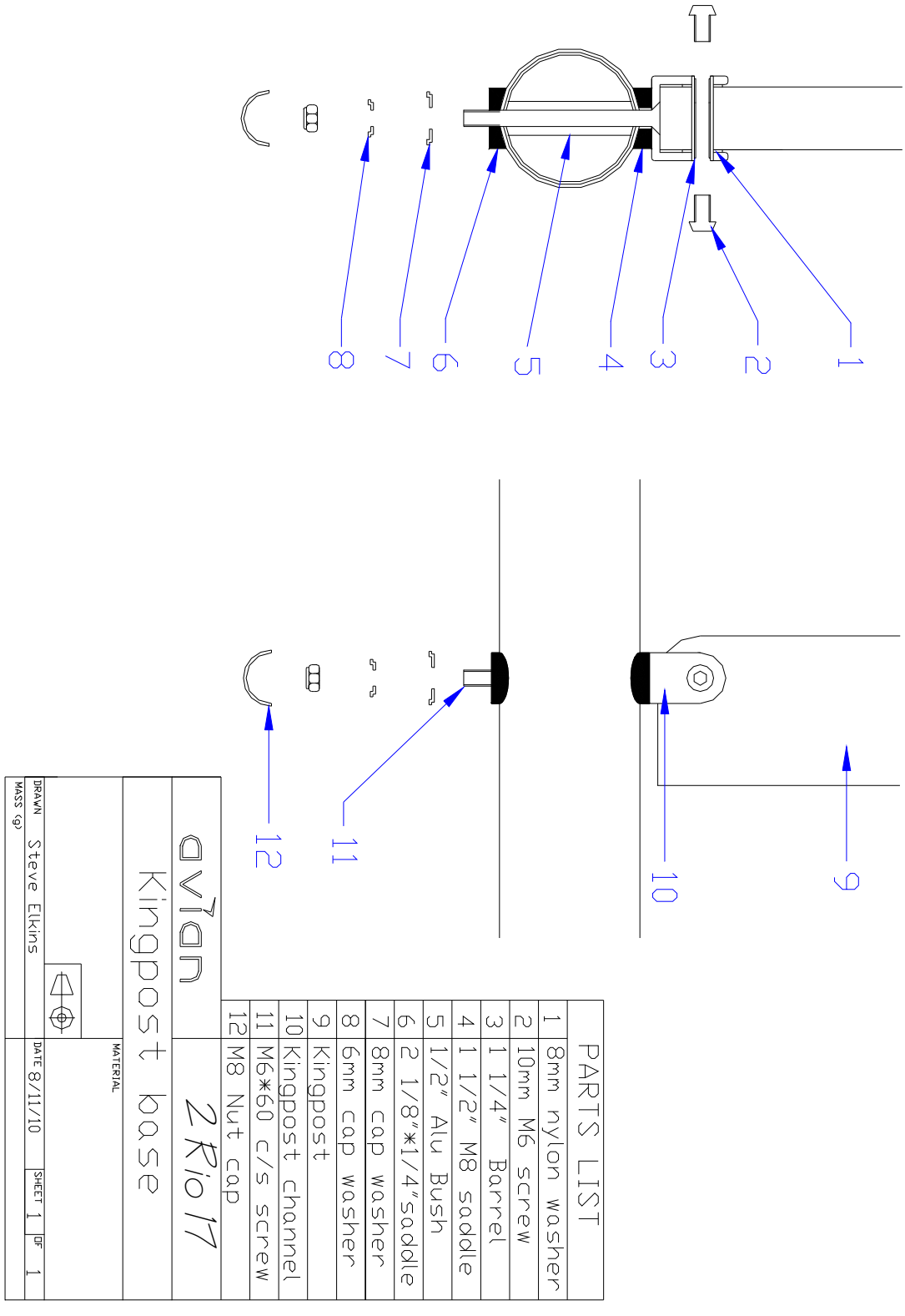
MASS (g)



PARTS LIST	
1	8mm nylon washer
2	10mm M6 screw
3	1 1/4" Barrel
4	1 1/2" M8 saddle
5	1/2" Alu Bush
6	2 1/8"*1/4"saddle
7	8mm cap washer
8	6mm cap washer
9	Kingpost
10	Kingpost channel
11	M6*60 c/s screw
12	M8 Nut cap

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2 Rio 17

Kingpost base

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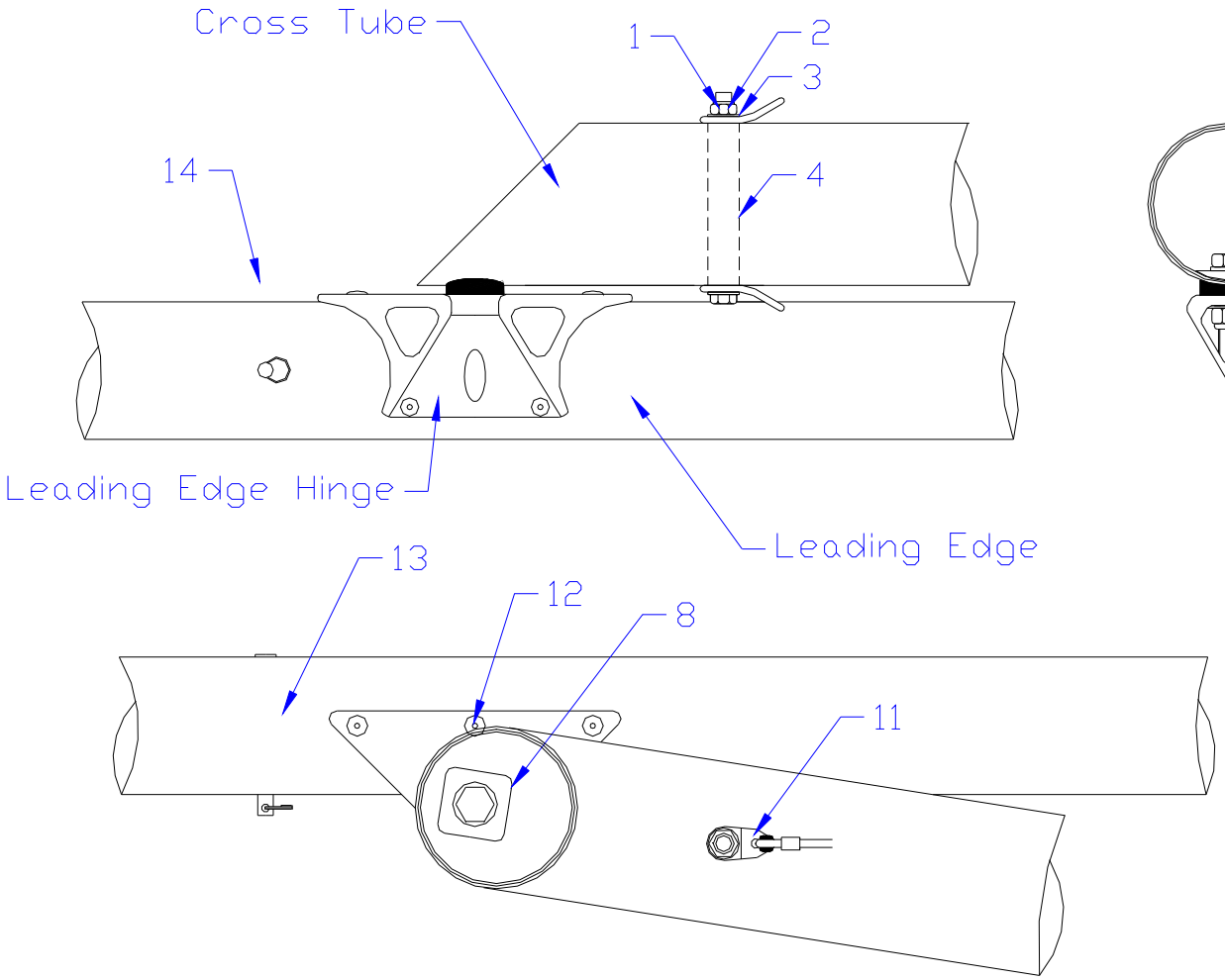

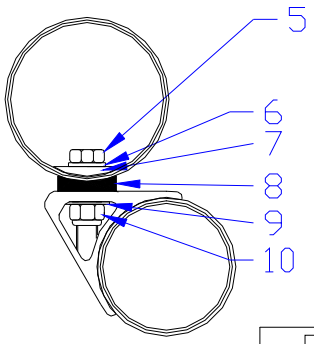

PARTS LIST	
1	M6 Nyloc nut
2	M6 Locking compound
3	6mm Stainless washer
4	Aluminium bush 1/2" ⌀D
5	M8 * 40mm Bolt
6	8mm Nylon Washer
7	Half round section
8	Small Saddle 2 1/8" * 8mm
9	8mm Stainless washer
10	M8 Nyloc nut
11	Side wire tang
12	3/16" * 13mm Monel rivet
13	10mm Dia Split Ring
14	6mm * 55mm Clevis pin

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XT - LE Junction

MATERIAL

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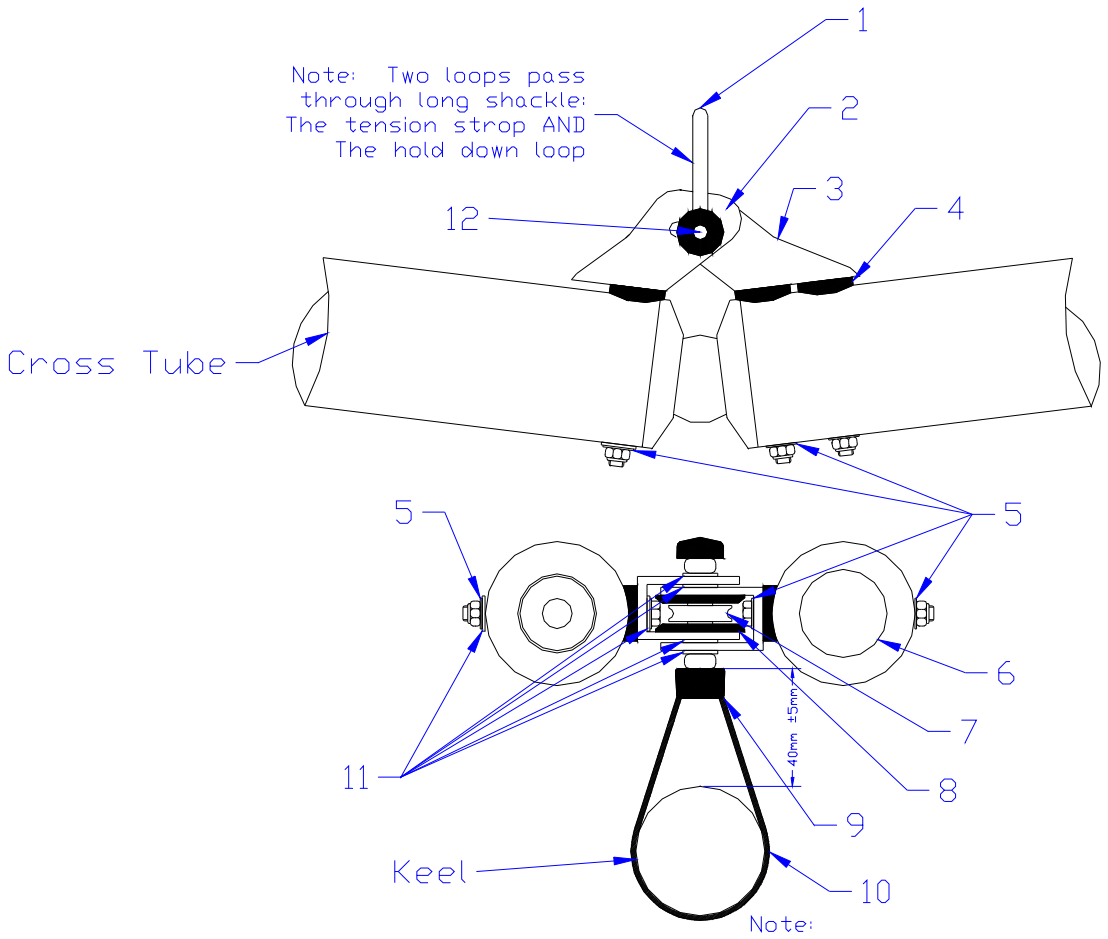

Note:

The measured height varies depending on position of the stitched overlap.

PARTS LIST		
1	Long Shackle	1
2	Single bolt hinge	1
3	Double bolt hinge	1
4	Small saddle ⌀D *6mm	3
5	6mm Stainless washer	6
6	White plastic 'ball'	1
7	Pulley and bearing	1
8	Pulley cheeks	2
9	Rubber bung	1
10	Hold down loop	1
11	Nylon washer	6
12	Sp allen head bolt	1

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Cross Tube Centre	
	MATERIAL
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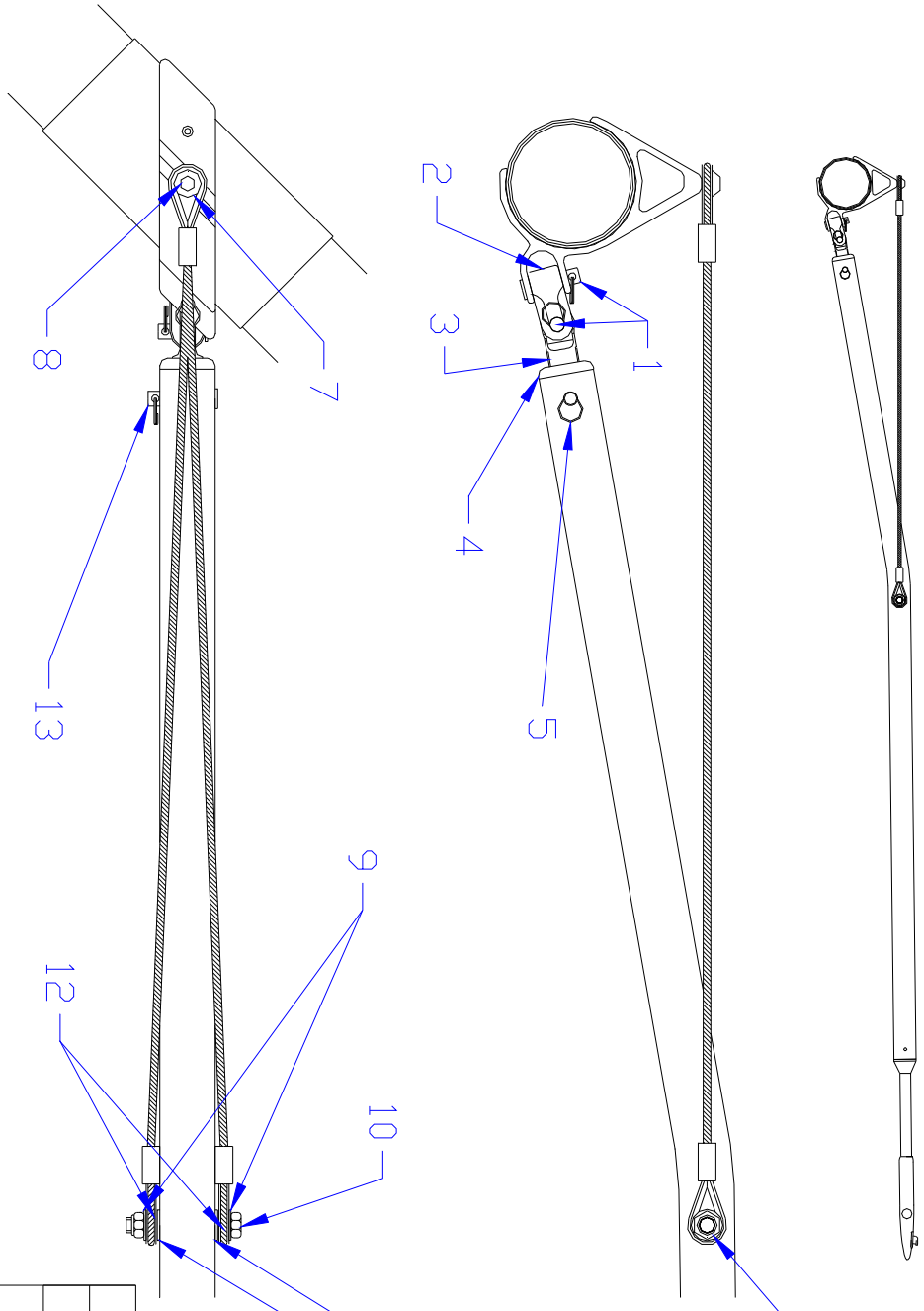
MASS (g)	



PARTS LIST	
1	Clevis pins 6mm dia.
2	Universal joint
3	12mm Eye bolt
4	Washout adjuster
5	Split ring
6	M6 Nyloc nut
7	M6 * 10 Button head
8	8mm Spacer * 2
9	6mm Stainless washer
10	M6 Bolt
11	6mm Nylon washer
12	8mm Spacer one per side
13	Clevis Pin 5mm dia.

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Washout Batten		
DRAWN Steve Elkins	MATERIAL	
MASS (g)	DATE 04/11/10	SHEET 1 OF 1