



SONIC *owners manual*

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AMENDMENTS

Version	Date	Changes
1.00	10/03/2004	Updated owners manual to new format
1.01	8/02/2007	Updated bolt list to show the difference between the KEEL / CONTROL BAR /("A" FRAME) bolt for round and aero uprights.

INTRODUCTION

Thank you for choosing your Moyes Sonic. You have made a wise choice as this intermediate glider epitomises all the qualities of safety, performance, and handling that is the Moyes tradition.

The development of the Sonic is indicative of the dedication of the Moyes design team who strive to offer a range of high quality hang gliders for ALL pilots.

The flying traits of the Sonic can be summed up in one word - EASY !!

EASY to launch because the glider with its positive handling at lower air speeds gives maximum control and safety.

EASY to fly due to light handling and an amazing glide and speed range. The quicker roll response and incredible sink rate make for easy thermalling and that will consistently leave you at the top of the stack.

EASY to land, due to a very low stall speed and excellent flare authority across the full recommended wing loading range.

Please read this manual thoroughly, familiarise yourself with the set-up and breakdown procedures, and take the time to practice these before venturing out to your site. Carefully study the section on Flying Your Sonic and remember, for your first flight choose a mellow day at a familiar site and ease yourself into one of the most enjoyable flights of your life.

Make sure you follow all appropriate procedures every time you fly. Never take anything for granted in the sport of hang gliding. If in doubt about any aspect of operating your new Sonic, consult your manual or seek advice from your Moyes dealer.

The Sonic is designed for the advancing pilot and the Birdmen from down under are happy to help with advice and hints that will not only make flying your Sonic safer and more enjoyable, but to help you achieve your full potential in the sport of hang gliding.

Since 1967, Moyes Delta Gliders has strived to be on the cutting edge of developing hang gliders of the highest calibre. A family-owned business operating under homespun values, we aim to provide a comprehensive international network to service all pilots. Even further, we work with some of the best pilots in the world to ensure that our gliders are stringently made and tested in order to improve their performance handling, and safety.

We wish you the very best flying,
The Moyes Team



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DESCRIPTION OF DESIGN

The Moyes Sonic, crafted with double surface and internal floating crossbar, is a combination of state of the art design features and materials, and high quality manufacturing standards, resulting in a uniquely high performing yet easy to fly flex wing hang glider.

The cut of the sail has been carefully crafted to determine a controlled twist distribution with a perfect match to the leading edge curve, giving flutter free performance throughout the speed range. The use of high quality Dacron, reinforced tip panels, streamlined nose fairing and a zippered inspection port giving access to the crossbar assemblies are features that set this sail at the top of its class.

A large Mylar-reinforced leading edge pocket and closer batten spacing gives the high camber wing a solid, distortion free airfoil for maximum lift and cleaner airflow at speed. With the combination of stainless steel reflex bridles and composite alloy/fibreglass battens, the Sonic displays excellent pitch stability and dive recovery. However, it is important to understand that any alteration of bridle dimensions or batten profile may reduce the glider's pitch positiveness.

The overall structural integrity of the Sonic is of the usual Moyes robust standard while the airframe geometry still allows for both on-frame and flat assembly as this situation requires.

The Moyes Sonic meets or exceeds all U.S.H.G.M.A. airworthiness standards.

SPECIFICATIONS

Model Size	Sonic 165	Sonic 190
Area	15.3 sq m 165 sq ft	17.7 sq m 190 sq ft
Span	9.1 m 29.9 ft	9.4 m 31 ft
Nose Angle	120 degrees	120 degrees
Aspect Ratio	5.4	5.1
Glider Weight	26 kg 57 lb	29 kg 64 lb
Optimal Pilot Weight	75 kg 165 lb	90 kg 198 lb
Hook-In-Weight	54-100 kg 120-220 lb	73-109 kg 160-240 lb
Packed-Length	5540 mm 18.2 ft	6400 mm 21 ft
Short-Packed Length	3920 mm 12.9 ft	4260 mm 14 ft
C of G Front of Keel	1640 mm 64.6 inches	1680 mm 66.1 inches
Number of Battens:		
Mainsail	15	17
Undersurface	4	6
VNE	74kph 46mph	74kph 46mph
VA	69kph 43mph	69kph 43mph
Trim Speed	32kph 20mph	32kph 20mph
Stall Speed	24kph 15mph	23kph 14mph
Max Speed	72kph 45mph	72kph 45mph
Best Glide Speed	43kph 27mph	43kph 27mph
Best Glide Angle	9:1	9:1

OPERATING LIMITATIONS

The Sonic has been tested and found to comply with current U.S.H.G.M.A Airworthiness Requirements. These standards require static aerodynamic load testing:

- with a positive 30° angle of attack at 65 mph;
- with a negative 30° angle of attack at 46 mph;
- with a negative 150° angle of attack at 32 mph; and,
- Pitching moment tests at 20, 35 and 50 mph to display the gliders inherent positive pitch stability through a broad range of angles of attack.

In-flight testing has shown the Sonic to be safely controllable throughout the complete range of usual operating conditions. The Sonic is capable of spins (which is not an approved manoeuvre), but is inherently resistant to them.

The Sonic has been designed for foot-launched gliding or soaring flight with the following limitations:

Flight operations must be restricted to non-aerobatic manoeuvres.

The glider must not:

- be flown by more than one person;
- exceed 30 degrees nose up or down to the horizon;
- exceed 60 degrees bank angle to the horizon;
- be flown in excess of V.N.E. of 46 mph;
- be flown inverted or backwards;
- be flown with auxiliary power without the approval of Moyes Delta Gliders Pty Ltd.

It is recommended that the pilot hold a minimum rating of Intermediate or equivalent.

Adhere to the recommended pilot clip-in weights as detailed in the specifications.

Indicated stall speed is approximately 25 mph at maximum recommended loading.

Indicated maximum speed is approximately 40 mph at minimum recommended loading.

DISCLAIMER

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 manoeuvres or erratic pilot technique may ultimately produce equipment failure and are specifically excluded from the warranty.

This glider is not covered by product liability insurance, nor has it been designed, manufactured or tested to any state or federal government airworthiness standards or regulations.

ASSEMBLY PROCEDURES

The following procedures have been tried and tested as the most efficient method of set-up. Your dealer should demonstrate both set-up and appropriate pack-up procedures when you take delivery of your new Sonic. Please note that the glider can sustain serious damage if the correct procedures for both set-up and pack-up are not followed. Refer to diagram insert for clarification.

1. Place the glider (still in the bag) on the ground with the nose end into the wind and the zipper up. The nose end is the thicker end. Undo the zipper.
2. Undo the ties that hold the control bar; remove padding and spread the (uprights/downtubes). Fold out the base bar and connect to the upright corner bracket with the bolt, castle nut and safety pin.

! CHECK

Check that all wires are outside the control bar.

! CHECK

Check that the bolt is correctly inserted through the base bar and nut and pin are inserted and secure.

3. Flip the glider upright and rest the glider on the control bar. The glider should be nose into a light breeze or at right angles to the wind in stronger breezes. Leave front wires unattached until you pull back the double wire cross bar restrainer cable.

! CHECK

Check that the front wires are not twisted.

4. Remove glider bag and all remaining ties and padding. Remove battens from within the folded sail at the nose end of the glider. It is a good idea to now fold your ties, padding and glider bag into a convenient bundle to avoid losing them.
5. Spread the wings, taking care that the bridles and top side wires are not snagged around the keel or keel fittings.

! CHECK

Check that your glider is in no danger of being blown over.

6. Erect the king post and attach rear top wire to the top of the king post by clipping the small carabineer through the thimble.

! CHECK

Check that the bridle lines are not twisted or kinked.

! CHECK

Check that the rear top wire is not through or around any of the bridle lines.

The king post should now be firmly fixed in a vertical position.

7. Take the battens from their bag and lay the green-tipped battens behind the right wing, starting with the keel (longest) batten, out to #7 near the wing tip. (The right wing is on your right when facing forward with the glider as if to fly.)

The two straight blue-tipped battens are under-surface battens.

Take the red (left) battens and match them against their appropriate green partner and check for symmetry. If any inconsistencies occur, the full set of battens should be checked against the template and corrected. (Refer to General Tuning section.)

8. Insert top battens #1 - #6, gently pushing them into their batten pockets and secure them with doubled bungee cord at the trailing edge. Do not force the battens.

! NOTE

If the battens fail to slide in completely, first check if it is the correct batten for the pocket. Most likely is that the batten has stopped against the back of the leading edge and requires lifting over to the front. To do this either flick the sail up and gently push the batten at the same time, or walk to the front and lift the sail forward bringing the batten tips over the leading edge. The second possibility is that the batten pocket has become twisted at the under-surface seam. This is corrected by twisting the batten or by lifting the top surface as you slide the batten past the seam.

! CHECK

Check that the battens are secured with doubled bungee cord.

! CHECK

Check that the Mylar inserts along the leading edge have not been curled over whilst inserting battens.

Move to the rear of the glider at the keel and pull back the double wire crossbar restrainer cable so the stainless steel shackle will clip into the Bailey Block at the rear of the keel.

! NOTE

FLAT SET UP

Move to the rear of the glider at the keel and pull back the double wire cross bar restrainer cable. Raise the keel 10" (250mm) off the ground so the stainless steel shackle will clip into the bailey block.

9. The tip (#7) battens can now be installed. These battens locate onto the hook found on the back side of the leading edge about 1 1/2 ft. inboard of the tip. Sight through the sail at wingtip to ensure the end of the batten is engaged on the hook, and secure with double bungee.
10. Insert the four under-surface battens. These are marked with dark blue bands. Slide battens into appropriate pockets and secure with single loop bungies.
11. Move to nose of glider and insert nose batten, then fit nose fairing by matching Velcro strips, and press to secure.
12. Be sure under-surface zipper is closed, and check that your hang loop and back-up loops are in the correct position. Attach your harness to the hang loops, ensuring that the carabineers are closed, the loops are the correct length, and hanging straight from the keel.

! CHECK

Check that hang loops are not damaged.

PRE-FLIGHT CHECK

On the Sonic many of the assemblies and parts to check that are normally visible on beginner or intermediate-type gliders are concealed to reduce parasitic drag. It is still imperative that you have a complete and systematic checking procedure that is performed before every flight.

It is best to start at the same place and follow the same routine, returning to the start point for every pre-flight. If you are distracted part way through the checks, return to your start point and begin again.

A worthwhile habit to develop is to touch or point to each component that you are checking. This ensures that the check is more than just a cursory glance.

In the set-up procedures, the last step was to check the hang loops and clip in the harness.

! NOTE

The harness already attached to the glider, and unless you intend to fly without getting into your harness, then you should never launch without being clipped into the glider.

Starting from the hang loops and harness:

1. Move to the top of the control bar assembly. Check that the nuts are secure and that thread shows beyond the head of the Nyloc nuts.
2. Check base of king post; nuts are secure and plastic saddles are not cracked or split.
3. Open under-surface zipper. Check crossbar assembly ensuring nuts are secure, and ball is centred in socket joints.
4. Sight along each crossbar looking for dings, dents and bends. At leading edge-crossbar junction check that top and bottom wires have no twisted thimbles or tangs.
5. Inspect the back of each leading edge ensuring that no dings or crazing are evident. Check that all battens are sitting correctly: top surface battens over and in front of leading edges, and under-surface battens are beneath leading edge. Close under-surface zipper.
6. Sight back along keel ensuring tension cable is not twisted and that keel is not bent or damaged. Do the same forward, and run your hands along the keel as you move to the nose area.

7. Release the bottom of the nose fairing and inspect the nose plate assembly: nuts, bolts, and top wire tangs and thimbles. Check Bailey Block for proper attachment of nose wires. Refasten nose fairing.
8. Sight along each leading edge checking that they have a similar curve. Any noticeable difference would indicate a bent leading edge that would cause a substantial "turn" in the glider's trim.
9. Move out along the wings feeling for dents in the tube.
10. Pause where the bottom side wire enters the sail and check the bolt and nut, etc., at the crossbar-leading edge junction.
11. Check that the tip batten is located in the hook on the leading edge.
12. Continue to the wing tips and check the sail mount pin and safety ring.
13. Check that all battens are secured with bungee cords and that no reflex lines are snagged on any batten ends.
14. At the keel, check the top wire attachment and that the bottom rigging has no twisted tangs. Check that the restraining cable shackle is secured in the Bailey Block at rear of keel.
15. Check the top of the king post, ensuring that the top rigging is not fouled and that the reflex bridles are free from twists.
16. Continue around the glider repeating checks 9 to 13 in reverse order, bringing you back to the nose.
17. Check all the lower rigging down to the corner fittings of the control bar.
18. Make sure the control bar uprights are straight and that all bolts and nuts are secure. Ensure that the base tube locking pins are engaged and protrude through the holes in the base tube.
19. Move up the control bar and recheck the harness, hang loops and carabineers.

The glider is now ready to fly! Make sure you are too!

Climb into the harness without removing it from the glider, making sure your legs are through the leg loops. Check harness height, helmet, instruments, wind at launch, and broader conditions. Ease yourself into your maiden flight aboard your Sonic. Please read the next chapter for a few hints on what to expect and how to achieve the most from the Sonic.

DE-RIGGING THE SONIC

Laying the Glider Flat

If the wind is over 10 mph and you wish to park the glider safely, it is best to lay the glider flat on the ground with the nose into the wind. To do this, simply lift the nose fairing to expose the nose catch assembly. Whilst holding the keel so the glider can't blow over, remove the nose wire ring from the Bailey Block and carefully walk forward with the nose of the glider allowing the control bar to fold back under the glider until you have lowered the wing to the ground.

Make sure you keep the nose slightly higher than the back of the glider throughout the lowering process and that the wings stay in the same plane.

If the glider is to be parked for any length of time, or if the wind is quite fresh, it is also advisable to unclip the reflex bridles to prevent the nose from being lifted by the wind. From here the glider can be quickly reassembled ready to fly again or be broken down as required.

Flat Breakdown

1. From the "flat" position above, remove the under-surface and #7 battens, and put them behind the glider. (Be careful as it is easy to forget these if they have been laid in long grass away from the other battens.)
2. Move to the rear of the glider at the keel raise the keel 10" (250mm) off the ground and pull back the double cross bar restrainer cable so the stainless steel shackle will remove from the Bailey block.
3. Remove the rest of the battens. To protect the aerofoil shape of the battens gather the curved ends together and feed them into the batten bag, slipping them as a unit right to the bottom of the bag. Slide in the remaining straight and #7 battens and shake them to the bottom, then seal the Velcro bag end.
4. Bring the leading edges in to the keel. As you do this, pull the sail over the leading edge so that none is caught between the keel and wing bars. Remember not to lift the leading edges too high when swinging them in.
5. Pull the sail flat so that the now doubled over sail forms a diamond shape. Keeping tension along the line from nose to outside diamond points, fold the sail toward the leading edge (as if folding a paper dart then repeat with a second fold. Do not take the sail right to the keel but lay the folds just outside the leading edges. Loosely roll the folded sail until it lays against the leading edges.

6. Unclip the king post and lay it forward. Clip the wire to the reinforced sail area around the king post base. Attach the reflex bridle clip to the same area. Don't forget the padded cover for the top of the king post.
7. Slide the padded sleeve up the keel until it covers the tangs and fittings at the rear of the keel. Place a tie under the glider (around the middle) and lift the two sail halves by wrapping the Mylar pockets up toward each other. Fasten the tie but leave it reasonably loose. Repeat with three more sail ties, tidying the rolled sail as you go.
8. Slide the batten bag into one of the leading edge Mylar pockets at the nose, straight end of battens first. The cambered end should be turned toward the other leading edge on top of the nose plate. Firm up all the ties by overlapping the Mylar pockets. Do not over tighten the ties. The Mylar pockets should be the only sail area showing, forming a smooth sheath along the length of the folded glider.
9. Place cover bag over the glider and flip the glider over carefully. Check that no loose folds of sail are caught between the keel and other bars and that the tensioning carabineer is not jammed between the bars as well. Tighten the nearest tie to stop any sail slipping there during transportation.
10. Detach the corner bolt and fold in the base bar. Bringing the wires neatly along the uprights, fold down control bar. Place padding over the bottom of the control bar.
11. Undo any ties holding the sail beneath the control frame and carefully tuck the down tube and base bar assembly under the Mylar sheath, ensuring all wires are between the uprights. Refasten the ties firmly. Check that the Mylar is not puckered or squashed by over tight ties, then zipper up the bag.

! NOTE

NOTES - When transporting the glider, make sure there is ample padding on the racks and that there is enough support to reduce bouncing and bending of the glider. Always tie the glider firmly enough so that bad roads and high winds can not bounce the glider loose. Make sure your carry racks are strong enough and can not blow free of the car in sudden gusts from trucks.

On-Frame Breakdown

1. With wings oriented 90 degrees to the wind direction, remove the nose fairing and release the wire ring from the Bailey Block.
2. Remove under-surface and #7 battens.
3. Release the crossbar tensioning cable and gently lower the wing tips to the ground.

4. Remove remaining battens and pack them in the batten bag as per flat pack-up description.
5. Release reflex bridles and clip onto the sail at king post base. Undo top back wire and clip onto same place, allowing the king post to fold forward. Cover king post top with padded bag.
6. Walk in each wing making sure that the crossbars don't jam between the leading edges. Pull the sail out and over the leading edges and fold them forward.
7. Fold the sail as described in flat breakdown and roll into the Mylar pocket. Loosely tie the sail to hold the first wing while you complete the other.
8. Pull the two Mylar pockets and rolled sail together and tie in several places, retightening and smoothing out the sail until a neat sheath is formed by the Mylar pockets. Check for caught sail between the crossbar and keel, etc.
9. Slide battens in Mylar pocket as described in flat breakdown over the glider.
10. Carefully flip the glider onto its back.
11. Disassemble the control bar and pack into its padding as described in the flat breakdown procedures.
12. Slide the keel padding sleeve over the keel fittings and place the nose fairing under a tie near the nose. Check that the battens are lying flat. Close the glider bag.

A lot of wear and tear depreciation can be avoided if you take time and care to breakdown and pack the glider properly. Follow the instructions implicitly and your glider will last in good condition for many years. Remember - never pull the nose of the glider down without the crossbars tensioned. Further information on the care of the glider is included in the Maintenance section.

FLYING THE MOYES SONIC

Harness Adjustment

In any glider it is important to have your harness and hang loop arrangement as simple and safe as possible, as well as being arranged to give the most comfortable and controllable position throughout the entire flight, from the start of your take-off run until your feet finally touch down at landing.

Due to the excellent low air speed control responses displayed by the Sonic it is best to have your hang loops and harness adjusted as low as possible within the control frame. This lower position gives maximum stability and greater glider feedback assisting you in making more accurate and smoother control inputs and therefore gaining more efficient response from the glider.

If you need to raise or lower your harness to achieve this position, it is preferable to change your hang loops accordingly. Your dealer may have already arranged for hang loops to match your harness, but if not, measure how much longer or shorter your hang loops need to be to give you a body/harness position just 2 - 3" above the base bar.

We at Moyes recommend that you use accurately sewn hang loops of the type supplied with the glider. These allow for a clean loop without knots that may possibly fail or cause delay if you need to unclip in a hurry.

Launching Your Sonic

Following your harness check, carry out your normal take off observations of wind, crowds and general conditions. For your first flights, choose a familiar site under familiar conditions. Do not attempt to fly in a new harness or attempt more demanding flights until you feel comfortable with the glider.

Due to the Sonic's high camber and deep airfoil wing section, its launch characteristics are extremely mellow and predictable. Depending on the extent of your past flying experience, certain characteristics may seem a little different. Firstly, a slightly higher angle of attack assists during the first steps of a light wind take-off. This technique allows for the wing to generate enough lift very early in the take-off and gets the glider floating high enough for your harness and body weight to start affecting some control. Once this point has been reached, provided you have maintained the wings at level, the glider can be easily accelerated to full flying speed without sudden pitch adjustments or desperate sprinting, purely by leaning into the run and applying your accelerating force through the harness.

Once sufficient air speed has been attained, an easing out of the control bar should result in a smooth and easily controllable take-off. Avoid trying to reach full speed on the first step, as the glider's static inertia will cause it to fall behind you resulting in a stalled angle of attack.

In windier conditions, hold the glider at the angle of attack that allows the wing to generate maximum lift without stalling or causing wing balance problems, but at the same time allows you to stand comfortably without being lifted or holding any glider weight.

If wire assistance is available, have them hold the front and side wire, but ensure you have advised them of what you require and what your commands will be. Never attempt a take-off if the wire person has not let go of the side wire or if they have not "cleared" to a position that is safe from interfering with your take-off. If they are either pulling down or lifting a side wire it means the wings are generating uneven amounts of lift and you must reorientate your wings until the wire person has "no weight", and you can hold the glider alone ready to take-off.

Likewise on the front wires, do not attempt to launch until the wire person has "cleared" and you are able to maintain total pitch control alone.

In Flight

You will soon notice how little effort is required to control the Sonic. While this was one of the design requirements for the model, you may find that unless you fly in a smooth, accurate and relaxed fashion this quickness of response may create a few problems for the tense and jerky pilot.

Glider Trim and Speeds to Fly

During the test flights for your Sonic, the factory test pilots will have set the hang loops to trim the glider's speed at a few miles per hour above stall speed and it is at this speed that the glider is most easily controlled.

Slowing down from this point to minimum sink speed will not reduce lateral control to any noticeable degree, and even beyond this towards full stall, the glider will maintain directional controllability. However, by pushing out this much, the glider will have entered a parachuting mode due to the greatly increased drag and a lessening of lift and is unlikely to be of any value in terms of efficiency.

Stalling the Sonic will result in a variety of predictable behaviours depending on how the stall is initiated. If it is approached gradually, as described above, the glider will show very little tendency to drop through, (ie. drop the nose automatically to regain flying speed) and as a result, the inexperienced pilot may have difficulty in recognising the initial stages of the stall. Therefore, close attention should be paid to the maintenance of air speed through the feel and sound of wind on the face as well as the position of the control bar relative to its trim position, and any increase of "back" bar pressures. If however the stall is initiated more suddenly, a definite "back" bar pressure should be noticeable as the glider loses lift forward of the centre of gravity more rapidly. Holding the bar out beyond this point will result in a quite dramatic nose drop and/or slip off to one side. Stalling in a turn or on a bank will cause the stalled wing to lose lift and drop into the turn while at the same time the glider will yaw around following the direction of the turn until the nose has dropped sufficiently for air speed to be regained. Once again

this tends to be a rather mellow reaction, and as the Sonic is highly spin resistant, control should be easily regained within 180 degrees of rotation.

Pulling the bar in from trim position and increasing air speed requires very little effort and as is normal with most aircraft, with the increased air speed we get a faster lateral response of roll rate. It is here that the erratic/tense flier will discover control problems. Any bump or pilot input that is not required and is subsequently harshly corrected for, will possibly result in an over response requiring yet further correction. From this a "Dutch roll" or high speed yawing behaviour may develop. To correct for this, immediately return to trim and stabilise your body. Try to restrict your inputs to slow, precise movements and the glider will respond in an equally smooth and precise fashion.

Turns

When cruising in ridge lift and smooth air the most efficient speed to fly will be somewhere around minimum sink. To initiate a turn, no extra airspeed will be required. Simply move your body into the direction of the required turn and as the glider responds and approaches the desired bank, relax any pitch pressures and allow yourself to smoothly return to the centre of the control bar. Always enter your turns steadily to avoid overbanking and the resultant needs to then high-side the bar to correct will be reduced. As the glider approaches the desired new heading, begin to level out the wings so that a smooth precise return to level flight can be achieved. During this phase of the turn, check your airspeed so that maximum efficiency is achieved.

To coordinate tighter turns and turns in thermal lift, the entry speed should be increased to just above trim or near to best L/D speed. Initiate the bank, and then relax on the pitch allowing the bar to return to trim as the glider moves into the turn. This should arc the glider around, coordinating the turn without side slip whilst still maintaining some spare air speed for continuing to 360 in a thermal or for reversal of bank if needed. Adjustment of bank angle can be made as required as sufficient airspeed is present to re-coordinate and to adequately handle any turbulence.

It is important that any weight shift be efficient, with no tendency to twist the body or allow the legs to lag behind the shoulders, as this action will delay response usually resulting in the pilot making excessive input and thus over controlling the glider.

When thermalling the Sonic, fly at a moderate speed between lift, concentrating on smoothness of control. Once centred in a thermal, the glider will respond to a reasonable amount of "pushing out" by increasing its climb rate. This is especially the case in flat 360's but always be conscious of your proximity to stall speed and its associated loss of performance and roll rate.

Landing the Sonic

The success of any landing is invariably linked to the accuracy and planning of its approach. Always leave yourself ample time to plan and set up a safe landing approach with options for variable conditions or misjudgement.

If you have been flying lower-performing beginner type gliders, then the extra glide and ground effect of the Sonic must be allowed for in the planning of the approach. Secondly, always fly your approach with moderate speed, even through turbulence so that no excessive yawing can develop. Nothing spoils a landing approach like a glider that keeps pointing off course. Once you have turned onto final (into the wind) make sure you are out of prone and your hands have transferred to the control bar uprights at about shoulder height. The glider should by now be levelled out a few feet above the ground with your legs trailing together beneath and slightly behind you. Your body should be leaning just slightly forward from an upright position. From here you will be gradually reducing airspeed to maintain this ground clearance, while "feeling" for the bar pressures that indicate that you are approaching a "mush" condition. While there is still enough airspeed left to affect a positive flare, slowly increase your rate of push out bringing it to a full UP and OUT arm extension. If the glider is gusted up or you have too much airspeed, stop pushing (but do not pull in) until that energy has been used, then aggressively complete the flare. Always commit yourself to holding the glider up and be ready to run a few steps to ensure the keel drops to the ground behind you. Never swing your legs forward in anticipation of landing as this will only guarantee a nose-in. If you push up and out in the flare, then your feet will automatically be underneath you as you settle in to land. You will find the Sonic easy to land as it maintains good flare authority right through to full stall giving a broader margin for pulling off consistently perfect landings.

GENERAL TUNING HINTS

As your new Sonic is test flown prior to delivery, you can have reasonable confidence that unless it has been damaged in transport it will arrive with standard factory trim.

This setting is achieved when the sum of the dynamic air pressures of the aerofoil (centre of pressure) are centred in the same position on the glider as the sum of the gravitational forces (centre of gravity).

The flight characteristics demonstrating this "trim" setting are as follows:

- The trim speed at which the glider will fly without pilot input is approximately 4 mph above stall speed.
- The glider will produce bar pressure to return to this trim setting whether it is slowed below or accelerated above this speed.
- The glider will fly straight unless acted upon by variations in the air.
- The glider will bank evenly, both to the left and right, showing no differing tendency to increase the bank (wind in to the turn) or to flatten out in the turn, thus coordinating identically in both directions.

If your glider develops any variations from these trim characteristics, then some minor tuning adjustments may be necessary to correct the problem. However, if the problem seems serious or you feel hesitant to make the adjustments suggested, please seek assistance from your Moyes dealer or at least a more experienced pilot.

Always check the simple things first:

Hang loops: (centre of gravity) Are the hang loops secure in their original position? Be sure the loops can not slip fore or aft from the set position.

Battens Bungies: (tensions) Have any bungee cords slipped or worn enough to give less tension? Check that the #7 battens are inserted correctly.

Once you have checked that the problem does not come from these sources, then a few more checks should be made. Firstly, try to recall if you had any hard landings or if the glider was flipped by the wind. If you can come up with a possible cause for the loss in trim then you are on the track to correcting the problem.

UNDER NO CIRCUMSTANCES should the reflex bridles be altered from original setting and specifications. Alteration of these could affect the glider's pitch stability and would possibly go undetected in normal flight conditions.

If the glider has developed a turn (this will be detected in flight by a constant need to hold your body to one side or by constant course correction) and trying your battens to the template has not removed it, and if you can recall a hard landing, especially where one wing took most of the impact, then there is a good chance that a leading edge is bent or damaged.

Bent or Damaged Leading Edge:

Remove the leading edges (start with the one on the side to which the glider seems to turn) and check them for bends or dings. If you can not find a bend, one of them may have been stressed and as a result, now displays a slightly different flexing characteristic to the other. (You will find directions for sail removal and leading edge removal in the Maintenance section.)

If the leading edge is bent beyond straightening (ie. if grazing of the anodising is evident then the bar is likely to be beyond salvage.) or, is dinged then it will need replacing either as a front or back section, or both.

To straighten, place the centre of the bend mid-way between two well padded supports, with the bend curving up, apply a steady downward force releasing once the bar flexes just beyond a similar deflexion in the opposite direction to the bend. Carefully inspect the tube to assess any improvement and repeat, becoming more gentle as the bend is reduced. Never over-straighten and if the bar seems to return to straight or beyond without much effort then it has been over-stressed and will need replacing. Always look for signs of crazing and feel for deformation around the vicinity of the bend.



NOTE

This repair is very delicate and should only be attempted if the bar is only slightly bent. It is always a good idea to consult your Moyes dealer before rushing in.

Sail Tension

The Sonic has only one sail tension setting on the leading edge and creation of a new tension setting should only be carried out by suitable qualified pilots. (See Dealer Tuning section.)

Reshaping Battens:

To reshape the battens for wing drop during a turn or bank, adjustment should only be made to battens #5 and #6. Assuming the battens have no damage (checked before), increase the camber on batten #6 on the side to which the glider seems to drop in the turn. To do this, take the other #6 and use it as a guide. Carefully bend the batten a further 1/2" (approximately) making the increase in camber a smooth continual adjustment rather than short and sharp. Check against the other batten. The adjustment should cause the front tip of the batten to extend about 1/2" beyond and below the original shape. Test fly this adjustment and do the same with the #5 batten if more adjustment is required.

This alteration will cause the tip to generate more lift at lower speed when on the inside of a turn. Over cambering will only result in the problem changing to the other wing and an overall performance reduction.

Trim Speed

Trim speed adjustment can be achieved by moving the hang loops forward to increase trim speed or aft to bring the speed closer to stall. Once again, never move the loops more than 1/2" at a time, ensuring that they are secured in their new position. At any stage it is unlikely that adjustment beyond an inch or two is ever necessary. Should you feel that greater adjustment is required than please ask your dealer to retest the glider.

After many hours of flight time the trim speed will gradually change as the sail stretches and the airframe acquires a memory to its tensioned curves. This is a normal process for all gliders and allowance for this is incorporated in the maintenance schedule.

Whenever you make adjustments, only change one thing at a time. If no improvement is apparent after making several adjustments, consult your dealer and have the airframe thoroughly checked before getting too far from the Sonic's original trim settings.

GLIDER CARE

The modern hang glider requires very little in the way of maintenance, especially if you take a little extra care with your day to day use and treatment.

Storage

Keep the glider in its bag and store in a cool, dry place. It is best if the glider is stored on some suitably padded racks where the air can circulate. Avoid leaving the glider on the floor or ground for any length of time as this allows ground moisture and small creatures to work their way into the sail.

If you live and fly on the coast it is advisable to regularly flush your glider with fresh water (always do this before any lengthy storage). Leave the glider open in the sun to dry COMPLETELY, including the inside of the bars, before packing away.

If the glider is wet or damp after a days flying, dry it in the sun the next day. If this is not possible, place the glider bag zipper down on your storage rack, open the zipper full length and release all the glider ties. Loosen up the sail so that air can circulate as much as possible. Set-up the glider and dry properly on the first sunny day.

Sail Care

Avoid contact with any oils, solvents, caustic or acidic substances. This includes salt water, salty sand, animal dungs, and preservative treatments such as Armour All.

As synthetic cloths such as Dacron are deteriorated by ultra violet light, always keep the glider in its bag when not being flown.

If the sail must be washed, use fresh water. For stubborn stains a weak detergent may be used provided it is THOROUGHLY rinsed from the sail cloth. If the sail comes in contact with any of the substances listed above, it is recommended that you remove the sail and have a professional sail maker attempt to save it.

For small rips and tears on non-stressed areas, sticky-back sail repair tape can be used to prevent fraying. A sail maker should make any repairs to larger tears or damage on high-stress areas, such as along the trailing edge and at sail mounting grommets.

Always use the protective padding supplied when packing up your glider and take that little extra time to ensure you have no sail caught between metal fittings. Abrasion caused during transportation is most commonly the result of a lack of care in this area. (It also greatly reduces the life and resale value of your glider.)

Battens

When inserting battens, always take care to push them smoothly, and never force them. Pushing them rapidly or at an angle may damage the pockets or sail. Sand in the batten pockets will help abrade the pocket ends eventually resulting in a hole and requiring an expensive sail repair.

Take care with the battens and avoid unnecessary damage by packing them in the correct manner. If reshaping is required, avoid over working the tube as this will soften the alloy causing the batten to lose shape more easily.

Take care when removing the battens. If you are packing up using the "on-frame" method, don't allow the fibreglass end to get caught on the ground behind you. This causes some pilots to think the batten is stuck and the resulting extra force snaps the fibreglass end.

The tip batten should never be lifted when being removed as the plastic tip may jam in its cup and be snapped.

Rigging Wires

At the first sign of any fraying or kinks you should replace the wire immediately. Keep a constant eye for damage to the outer plastic coating or any discolouration as these are a sign that damage may exist either from an external force or from corrosion.

If the thimble has been elongated, then the cable, thimble and nico-press have been exposed to a force of over 300-400 lbs. Once again, replacement of the wire is advised.

If you frequently set-up or break-down on rocky ground, you will need to inspect and replace your cables more often.

If by some chance your wires are immersed in salt water, it is advisable to at least replace your bottom side wires. Wires are not expensive but do play a rather major role in holding the glider together.

Tubing

Once again, contact with salt air and water are a major concern and removal of the tube end caps will be required to thoroughly flush out with fresh water. Corrosion and electrolysis set up amazingly fast; follow your maintenance schedule conscientiously.

If wear marks or scratches begin to appear on any tubing, carefully investigate your pack-up procedure and pad the areas showing wear.

Following any hard landing, check the impact areas for dents and bends. Opening the sail upside-down and inspection inside the double surface will probably be required.

Hardware

All the Sonic hardware is of aircraft quality and stainless steel. However, there is no such thing as an indestructible material, so regularly check for bent bolts, especially following harder than normal landings or impacts.

Ensure that thread is exposed above all locknuts.

The hardware fittings are often the cause of sail and tube wear if they are not padded correctly.

The plastic components are tough and carry very little load, but once again, unusual impacts may cause stress fractures. It is therefore important to be aware of their condition.

Avoid over-tightening nuts. Junctions should be free to swivel, especially rigging tangs and terminations.

Transportation

Always have sufficient padding between the glider and supports. To avoid any chance of bending the glider during transportation, three support points should be utilised, with the glider being firmly tied at all three points. Avoid unequal overhang at the ends and ensure that should the glider project beyond the rear of the vehicle, sufficient warning is available for the following motorists.

The extra care advised in this section will extend the flying life of your Sonic and help maintain its resale value for the time when you may wish to move up to the higher performance models.

MAINTENANCE SCHEDULE

Apart from your normal pre-flight checks, and even if you have conscientiously maintained the glider in A1 condition, more thorough checks of the glider are necessary from time to time. If you follow the schedule faithfully, you will not only extend the possible life of the glider, but give yourself many more hours of anxiety-free flying.

Every 10 hours:

- Check top and bottom surface battens against template.

Every 50 hours (or 6 months):

- Inspect the sail. Apply sail repair tape to any small rips or tears. Check the stress areas of the sail, including the sail mount screw grommets and the total length of the trailing edge. A tear or nick in the trailing edge will need professional sail-maker repair. The reflex bridle attachment tabs, the king post opening, and wire slots are also prone to wear under certain conditions, so inspection here is also necessary. Any critical sail damage should be repaired by a professional sail maker.
- Inspect all batten bungee cords and replace or re-tie where necessary.
- Inspect crossbar tensioning rigging and fittings.
- Open under-surface and crossbar plate cover and inspect crossbar ball and socket joints, nuts, and bolts, and associated components.
- Check all tubing for dings, bends and wear damage that could occur during set-up, breakdown or transportation.
- Inspect cables for broken strands with special attention to the thimbles and attachment points. Check any areas with plastic coating damage more closely.
- Check that thread shows beyond all locknuts and that safety pins and rings are serviceable and not prone to accidental opening.

Every 100 hours (or 12 months):

This annual inspection can be done by yourself but preferably your Moyes dealer or qualified hang glider technician should be contacted to carry out this complete strip down.

CHECKING THE SONIC STABILITY SYSTEM

Use No. 8 Plaited Nylon Bricklayers Line to check the luff lines of your glider, this is done by using a string with a loop on each end, place one end of the string over the batten, below the luff line which is being measured.

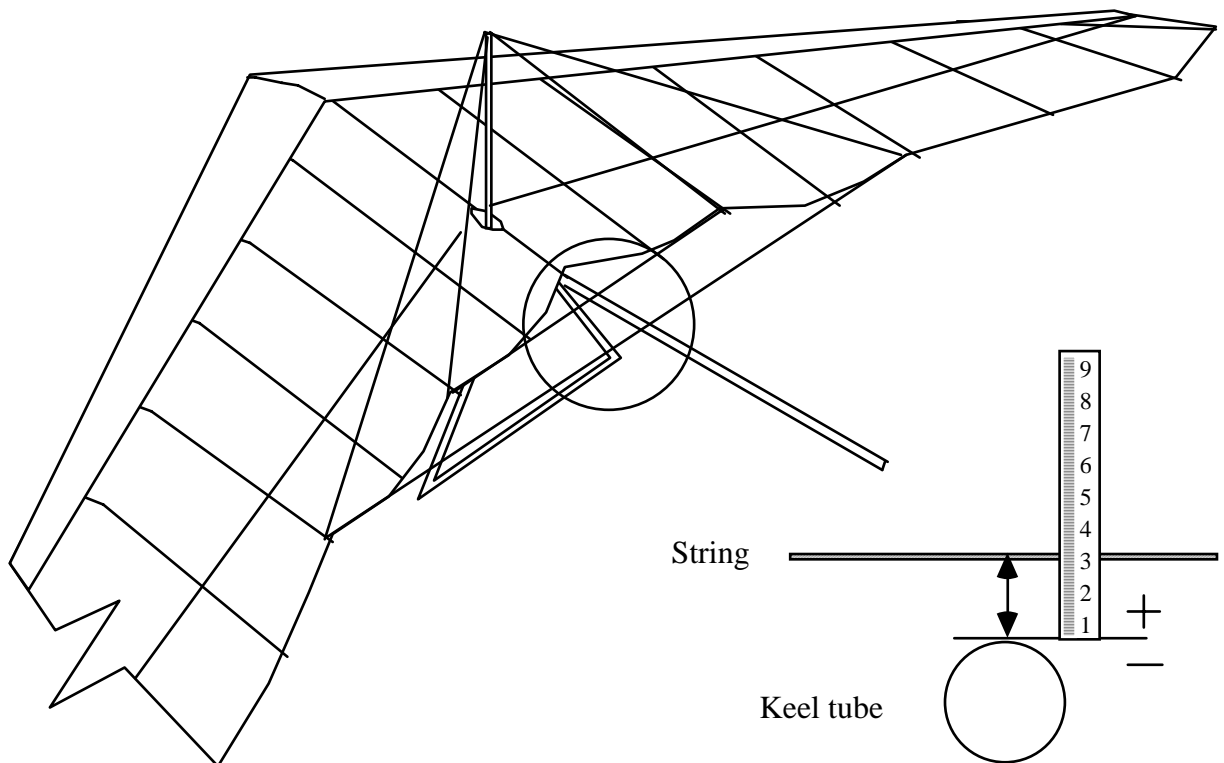
Attach the other end of the string tightly over the batten of the same luff line in the opposite wing.

Measure the height of the string above the keel to the proper height.

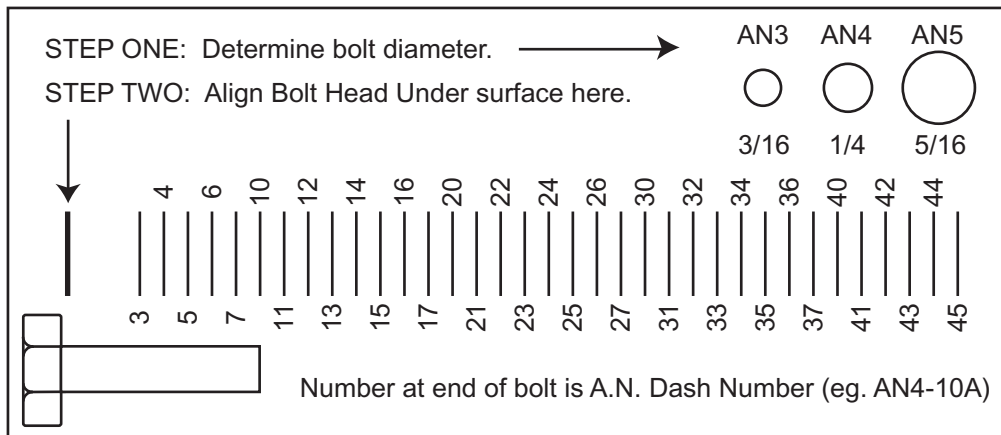
Use the same method to measure the second luff line.

Sonic Stabilities

Model	Batten Numbers							
	2	3	4	5	6	7	8	
Sonic 165	187mm		254mm					
Sonic 190		225mm	259mm	247mm				
Sonic 190 VG Loose		205mm	226mm	219mm				
Sonic 190 VG Tight		211mm	239mm	235mm				



AN BOLT INDEX



BOLTS LIST

JUNCTION	PART NO.	QTY.	NUT	WASHERS
NOSE PLATE / LEADING EDGE	AN4-26A	2	H	3 MED. PLASTIC
NOSE PLATE / KEEL / FRONT	AN4-30A	1	H	
NOSE PLATE / KEEL / BACK	AN4-34A	1	H	
KEEL / CONTROL BAR / ("A" FRAME) Round Uprights	AN5-25A	1	F	1 METAL
Aero Uprights	AN5-27A	1	H	1 METAL
KEEL / KING POST / "U" BRACKET	AN4-22A	1	F	1 METAL
KEEL / BREAKDOWN BOLT	AN4-20A	1	H	
KEEL / BAILEY BLOCK (FRONT BOLT)	AN4-27A	1	H	
KEEL / BAILEY BLOCK (REAR BOLT)	AN3-23A	1	F	
CROSS BAR / CENTRE R/H REAR	AN4-27A	1	F	2 MED. PLASTIC
CROSS BAR / CENTRE R/H FRONT	AN4-27A	1	F	1 METAL
CROSS BAR / CENTRE L/H	AN4-27A	1	F	1 METAL
CROSS BAR / CENTRE BALL	AN4-25A	1	H	1 METAL
CROSS BAR / CENTRE/ HINGE	AN4-12A	1	H	2 METAL
CROSS BAR / END PLATE INBOARD	AN4-10A	2	H	1 METAL
CROSS BAR / END PLATE OUTBOARD	AN4-32A	2	F	
LEADING EDGE / CROSS BAR BOLT	AN5-26A	2	H	2 L. PLASTIC & 2 METAL
DOWN TUBE TOP / STEEL BRACKET	AN4-12A	2	H	
DOWN TUBE TOP & BOTTOM / PLUG	3/16"X 1.125	4		RING
CLEVIS PIN				
DOWN TUBE / BASE TUBE CORNER	AN4-14A	2	H	
BASE TUBE RIGHT	AN4-13A	1	H	
BASE TUBE LEFT	AN4-14	1	CASTLE NUT & PIN	
CROSS BAR PULL BACK SHACKLE	AN4-10A	1	H	
KING POST	AN4-12A	1	H	
KING POST / BOTTOM BRACKET	AN4-12A	1	F	

