Operating Manual ATOS VR

Operating Manual

Read before setup or flight!

Congratulations and welcome to the ATOS - family! The ATOS VR you have purchased is a high-quality aircraft. So that you can get the best out of your ATOS VR and avoid damage while setting up, you'll find it helpful to study the following manual closely. If you have difficulty or problems, your A.I.R team stands ready to help you.

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Click on above image for larger view (and on any of the following images if your cursor turns to a hand when you place it over the pictures).

Transporting on the car

The carbon fiber D-cells are sensitive to puncture loads. For vehicle transport, be sure to support the glider in at least three points with a well padded surface. This can be achieved by support as shown or by a ladder with padded rungs. With only three bearing points the D-cells should be supported by areas 4-8 inches by the 20" width of the glider.

The straps should being tightened only as firmly as necessarily and be put next to each other instead of on top of the other.

On wet roads and particularly with salt on the roads a waterproof glider bag is recommended - of course available from your local ATOS Dealer. Otherwise the ATOS VR should be dried as soon as possible to avoid damp stains in the sail and corrosion of the metal parts. Also the D-cells and ribs can take up moisture if they are wet or in high humidity and should be dried as soon as possible.

Set-up procedure

1. The ATOS should not be laid directly on stones, since there can be pressure points on the D-cell. If this is can not be avoided, then it is advisable to put the ATOS down on a surface that is slightly concave. The rear end gets less load and the front is less sensitive to pressure points. In a very rough area, the nose can be rested on a harness. Note how the glider is packed as you open it for the first time.

2. Remove the basetube from the D-Cell and raise the uprights. Do not allow the uprights to inadvertently fall. This could damage the sail, D-cell or the #1 rib. When installing the base tube, it's best to **stand**

behind the uprights with your body pushing against the downtubes and holding them up. Fully insert the pip pins and cover with the rubber tubes.



3. Stand the ATOS VR up on the control frame. **Important with uneven area:** The wing must stand stably on the control frame. If it should tilt against the top of the upright connection, the D-cell can be damaged or the sail compressed. It's easiest to lift the D-cells straight up with one hand while rotating the control frame underneath with the other.

4. Remove all the parts from the D-Cell including the rib cam tool and the pull out the barrel ends of the spoiler wires. Stuff half the glider bag in the left and the rest in the right D-Cell.



5. Prior to opening the wings, be sure that the two halves of the nose connection are opened wide out. If not, they could be compressed into the D-Cells or other parts by the nut-cracker action of opening the wings.

6. Lift the end of each wing SLIGHTLY and swing the wings open, keeping them in the normal plane, until the stinger touches the ground. Depress the pins at the keel/stinger junction and remove and swing the stinger to the side allowing the keel to rest on the ground when the wings are full opened (put something under the keel so that it doesn't pick up dirt where the stinger inserts in the keel)

7. Connect the sail rings to the bracket at the top of the control frame by depressing the pin in the center of that bracket (picture below). Make sure you hear the pin snap shut locking the rings in place. **Note : Be very cautious of the flaps. Do NOT twist them or bend beyond a 20 degree angle.**

Start the upper and lower zippers and close approximately half way.

8. Engage the nose mechanism and with the cam tool, push the connection closed and insert the pip pin to secure it in place. The hook end of the latch must be **through and behind** the opposing piece to insert the pip pin. **Note - place your hands as shown and be cautious in this process that you do not allow your face to be close to and in front of the latch. If your hand or the tool were to slip off the latch, it would spring open forcefully and be potentially, very damaging**.

9. Walk to the rear of the keel, lift it and insert the stinger being sure hear both pins snap in place in the

stinger.

10. Collect the aluminum tube and carbon ribs and wing tip for one wing. The left wing components are marked with red spots - the right with green. On the ribs, there's an indication on the colored spot, of the edge that goes up. Remove the wing tip bag - you can roll it and secure with the Velcro strap or stuff in your back pocket. The description from here is based on the left wing assembly and you will have to mirror that process for the right.

11. Start the tube end with the key into the last section of the sail (between the last and next to last fish cams) and rest the outer end on the ground. Stand behind the sail and open the Velcro of the third section to see the end of the D-cell. This will allow you to elevate the tube with your left hand as you guide it into the D-cell with your right making sure to not trap parts of the internal material.

12. Slide the tube in aligning the key and the key slot until the tube bottoms out (pictured above). The carbon leading edge shell packs along the front edge. You'll be able to find it just outside the end of the D-cell as shown, slide it out along the aluminum extension tube. Now pull the sail outward so that you can bring the last fish cam around the tube end leaving the tube extending from the end of the sail (shown below).

13. Depress the two pins on the Wingtip tube and slide it into the extension tube until they pop and the wingtip is solidly engaged. Slide the carbon leading edge extension out until it overlays the white wingtip.

14. You are now prepared to engage the tip wand and tighten the sail to the wingtip. **TIP: It is important at this point to have the sail well aligned with itself. Tear the Velcro apart going back 24+ inches. Align the very tips of the sail - top to bottom and then match and seal the Velcro (leave open as much as shown).** Grasp the **tip lever** in your left hand and the **tip wand rope** in your right (there are three ropes - one at each end of the tip lever and one on the end of the tip wand). Pull the lever toward you and the push the rope inside the sail to engage the wand tip to the lever. Observe how the left hand stays below the wing tip and in line with the plane of the sail. **Be sure you are not pushing toward the D-cell - you will be working against yourself and will find this step and especially the next, very difficult.**

15. Now you want to rotate the tip lever around the tip wand end. Grasp the **upper lever end rope** in your left hand and the **lower lever end rope** in your right. The best action is to pull the left hand to the rear and guide the right hand into the sail and against the wand. Notice the left hand is below the wing tip and that both hands **remain in the same plane as the sail.** Please review the section on adjustments prior to your first setup.

16. With your body against the wing tip, pull the sail edges out and toward the wingtip to allow you to properly fit and seal down the Velcro on the sail to the wing tip Velcro. Stuff the lever ropes into the sail and smooth out the sail. **Make sure you do not push on the upper part of the wing tip in this process.**

17. Next go to the end of the D-cell and open the sail so that you can see how the interior ribs are folded. **Note the order** as it is important when folding up the glider that the last rib is the last one to fold in. Open the ribs and the first one to connect is the last rib on the D-cell. Here again it is important to have the sail aligned. Open the sail Velcro either inboard or outboard of the fish cam, realign and reseal the sail. Bring the fish cam to the end of the rib. Slide the cam tool onto the cam and tighten by rotating the cam around the end of the rib. Use your left hand, palm up and thumb on the cam at the end of the rib tip to help rotate cam onto the rib. Do not pull against the sail or push on the upper part of the rib, just be sure to **rotate** the cam. Look in the sail and attach the shear rib Velcro - it's the material at the center of this rib.

18. Next cam in place the rib with the spoiler arm mechanism. If you learn to control the fish cam with your left hand and the rib with your right (palms up - see the picture), you'll find that to be the quickest technique and require the least amount of the Velcro to be opened. It also saves your skin from the hook portion of the Velcro which is the most abrasive. After that, connect the bungee to the spoiler arm - this must also become part of your **Preflight Check**.

19. Now insert and cam in place the larger of the 2 outboard ribs and then the smaller. If you look in the sail, you can see the aluminum stop that they go against. Keep the sail aligned at the rear.

20. Next, cam in place the inboard ribs moving from the spoiler arm rib inward. The technique is shown above. Seal the sail Velcro behind as you go by gently lifting the flap and smoothing the sail Velcro. Remember that if you pull the sail on the top to smooth it, you may just transfer a wrinkle to the bottom. The sail will lay smooth on both sides if it's properly in place with the same tension at all points. The fish cams should be firmly in place, but there is no advantage, and only more wear if they are over-tensioned. Now perform all the same steps to the right wing.

21. Pull the flap pins down and away from the keel in order to get enough room to insert the flap pins into the tabs on the flaps themselves. The above pictures show the sequence.

22. Secure the tail plane in place by placing the tail wings on the carbon spar and then running the threaded bolt through to the assembly on the keel. The bolt should be tightened snugly with the Allen wrench on the end of cam tool.

23. Stow the padded keel sleeve and tail bag. Place the nose cone securely in place aligning the upper and lower Velcro.

24. The last step is to insert the spoiler wire ends into the control frame and insert the pip pins. Slide the rubber bungee over the pip pins to insure they remain in place and clean up the aerodynamics.

Preflight Check

Important: Accomplish the pre-flight check after each setup extremely conscientiously! Even if only one point of the check is forgotten, this can have dangerous consequences!

Make your process standard: It's best to begin from the nose of the aircraft and make one completely circle. Check each of the following and each step you performed in setting up the glider.

1. Pip Pin's in the control frame corner must be secured with the rubber covers.

2. Connection of the elastic to the spoiler lever.

3. Examine Spoiler levers for operation smoothness.

4. Open the sail between behind the spoiler rib in order to be able to see into the wing. Examine whether the spoiler rope runs freely. **Important: The spoiler rope must run unhindered along the D-cell. It could be bound up e.g. around a rib.**

5. Visually check whether the spoiler rope is worn in the range of the pulley's throw.

6. Open the lower zipper and observe the spoiler rope and wires of the control frame. Look particularly at the short wire that runs between the wings and across the pulley just behind the nose connection. **Important: Even with only one broken braid the wire must be replaced!**

7. Check the smooth operation and wear of the flap rope. The rope must run freely on the pulley.

8. Also the rope to the tail mechanism, check for wear, adjustment, and normal operation.

9. Right and left flap should easily pull to the same excursion and not bind when in the 0° position (flaps not deflected).

10. The tail unit must seat normally on the base mechanism without any gap.

11. Check spoiler range by raising of the wing and moving the control frame with your foot. The spoiler should move with low-friction and the maximum range of approx. 70-90° must be achieved. The outside spoiler should have at least approx. 60-80° maximum excursion.

Storing the glider bag in the D-cell affects the static balance and trim favorably, but you should always put it in the same place as to not change your trim.

Disassembly

1. ALWAYS detach the spoiler wires from the control frame first. Moving the folded wing with the wires attached will deploy them and surely tear the sail. Remove the nose cone and take the wing tip bags with you.

2. Disassemble the tail plane and store in the bag.

3. Detach the flap pins from the flaps.

4. Detach the ribs from the keel outward to the spoiler arm rib. Then remove the 2 outboard ribs and finally the spoiler arm rib and the last rib on the D-cell. **Be sure the outermost rib on the D-cell lays over the last two internal ribs. If this is not the case, the ribs can be damaged.**

5. Release the Velcro on the tip from the sail. Reach inside the sail and pull the tip lever end toward you to loosen and then disconnect the lever from the wand. CAREFULLY slide the carbon leading edge extension into the pocket along the front of the D-cell. Make sure the carbon extension is in far enough so that the tips don't extend past the D-call or they could be damaged.

6. Remove the tip and then slide the extension tube out. Place the ribs, tip, and extension at the front of the glider so that they are not accidentally stepped on.

7. While standing behind the sail, pull the sail out along the D-cell and then fold over as shown so that the outer spoiler lays white side to white side against the main spoiler. Tuck the tip lever and any fish cams into the sail. Fold the sail end back onto itself. Reach under the D-cell and lift the spoilers up to the bottom of the D-cell and the lift the flap so that it all makes an S fold against the bottom of the D-cell. Place the tip bag over the end of the sail and D-cell and pull it on. Lift the flap and separate the Velcro at a point where the tab on the tip bag just reaches. Attach the Velcro tab from the bag into the sail Velcro thereby securing the tip bag as shown. Disassemble the other wing in the same manner.

8. Separate the stinger and lay the keel onto the ground.

9. CAREFULLY release the nose latch and slowly lower the D-cells to the ground by opening the latch. **Again be careful not to let the latch snap open and injure you.**

10. Undo both zippers leaving the slide to the top end of the zipper. You must be careful of where the slides are so that they don't get crushed between the keel and the D-cells when closed up.

11. From behind the sail, disconnect the sail rings at the top of the control frame. Let the flaps rest against the uprights with the white side of the flap up. Here again you must be very careful not to twist the flaps from where they are trapped against the ground. If they need to be turned, gently lift the D-cell and the flap from the middle of the D-cell, then you can turn the flap over without twisting it.

12. Go to the end of the wing and swing the wing toward the keel by holding the tip bag. Do not lift the wing tip off the ground more than necessary. With both wings halfway to the keel, you will be able to reinsert the stinger turning the tail mechanism down and then pull the keel cover on.

13. Lift the sail at the nose up from between the keel and D-cell and fold the sail back 6 inches to protect the zipper teeth from being pinched between keel and D-cell. Pull the spoiler wire barrels out the front of the D-cell to also protect against crushing them between keel and D-cell. Continue to carefully bring the D-cells into the keel.

14. Remove the glider bag from the D-cell and store all the parts (except tips) in the D-cell on your left as you stand in front of the nose. Close the nose latch across the front of the glider.

15. Put the glider bag on and carefully lay over the glider. Hold the nose up with one hand and swing the control frame up as you lower it to the ground. Disassemble the control frame being careful not to drop the uprights on the D-cell. Fold the uprights down to the keel and cover with the padding incorporated in the keel bag.

16. Lay the flaps on top of each other. The spoilers should now be lying on top of the D-cells.

17. Pack the wing tips in the tail end of the bag so that the winglets lay flat on top of the spoilers.

18. The nosecone can lie between the flaps.

19. There will be room on top of the glider, under the winglets for the tail.

20. The basetube will go in the D-cell half that does not have the other wing parts in it. Insert the end first that has the straight pip pin connection for the upright.

21. Zip the glider bag shut.

Flight characteristics

Launch

The ATOS sits on the shoulders with a slightly tail-heavy feel. In the first steps it stabilizes in an angle of attack favorable for taking off. **In the next few steps the nose must be actively held down. In principle, it's better to have too low an angle of attack than too high. With a low angle of attack, the ATOS is little influenced in a cross-wind launch since the wing ends are higher above the ground and the spoilers have good flow over them.**

Before the first flight it is suggested to allow the glider to 'fly' in a medium wind either at the top of a small hill or running across an open area. Notice the effectiveness of the spoilers.

The **flap position** for launch is a setting of approx. +15°. With the flap against the keel, the deflection is approximately -5°. Foot launching the glider is very similar to launching a flex-wing glider. Accelerate the glider smoothly as you fly it off the hill.

From an aerotow dolly, a similar flap setting is advised. Adjust the cart so that the angle of attach of the glider is not excessively high, 15° to the horizon is practical.

Flight

In flight, only the spoilerons are used for roll control. Weight shift does nothing. The control loads for the initiation and roll-out from a turn are clearly lighter than with a flex-wing glider. The ATOS possesses high stability around each axis. Therefore all the input movements can be gently implemented. Roll the glider by pushing the control frame in the opposite direction until the proper bank angle is achieved, then release the pressure and allow your body to re-center on the control frame. Smooth inputs are advantageous.

With stronger deployment of the spoiler a slight pitch-up moment occurs, therefore you must **be particularly cautious not to fly the glider too slowly.** You'll have best results by smoothly flying at constant airspeeds. Close to minimum speed and maximum speed (90km/h - 53mph) the glider should absolutely be flown with an airspeed indicator. **Having a good airspeed indicator and understanding of your polar will be very important in getting the most performance from your glider.**

The ATOS VR is not suitable for Aerobatics. The glider can easily be over-sped and thereby, the structure overloaded!

Thermaling and high-speed flight

When thermaling set the flaps at 15-25°. This provides agile handling and desirable trim speed. With large or torn up thermals a smaller flap deflection, lower bank angle, and slightly higher speed will better average the up and down air. You'll notice that the glider trims more slowly with higher flap settings which can influence the combination of speed, bank angle, and flap setting that you choose.

At speeds of 32 mph and above, the best glide is achieved with the 5° flap position. VNE is 53 mph - the glider can be flown with the flap and tail cord completely loose in smooth air, in these upper speed ranges. **With the flap rope in the full off position, there will be little or no control bar pressure and so the requirement for an airspeed indicator. At airspeed above 45 mph, extreme turbulence can overload any hang glider.**

Landing

For landing the flaps should be pulled in to between 15 and 70°, since this gives the lowest stall speeds. Glide path will respond to airspeed the best with full flaps - pull in to steepen the glide path but always be careful to keep your speed up with large flap deflections. An approach speed of 30 mph is advisable. Particularly on your first landings it is advisable to take a long final and set the flaps while still above 150 feet. Hold your hands about half way up the uprights and body at 45°. Hold a steady speed to the ground and level out the glider until trim speed. Slowly but fully rotate the nose up. Be sure to hold the nose up and run under and through the control frame so that the glider will settle on your shoulders. If your hands and the control frame are in front of you when you quit running, you will not be able to support the glider's weight at arm's length!

Possible errors:

Too fast approach in combination with large control frame excursion. Adjusting the flap deflection late during the landing and not remaining the focused landing point ahead. Too small airspeed with a high flap

setting and letting the glider stall to the ground. Raising the hands too high on the control frame uprights. They should be in the area of the weak links. Be cautious of going to the uprights by moving one hand first and then pulling yourself up with that hand. It's easy to cause large oscillations this way.

Important: After setting the flaps for landing, throw the rope over the control frame to help prevent the inadvertent release of the flaps.

General comments

It is extremely important for maximizing your flight performance that you have a good airspeed indicator and understand your polar and speed ranges. For a pilot of approximately 200 lbs hook-in weight with clean harness and good flying posture, most competitive pilots assume a minimum sink rate of 135 ft/m at 23-24 mph and sink of 400 ft/m at 42 mph. Best glide occurs around 32-34 mph with 5° of flaps. All of this varies by altitude, temp, amount of dirt on the sail, etc. Experiments with a good flight computer will continue to improve your results.

Adjustment of the trim speed

The optimal trim speed lies between the speed of minimum sink and best glide. Slower will give a more comfortable thermalling position but leave you at higher risk of stall, and conversely for a higher trim speed. The most practical combination to begin with is trim speed of 28-30 mph with 15° flaps. This keeps you in the middle of the range with a slight speed bias for safety. There is not much sink difference between 24 mph and 28 mph. Most pilots will find it advantageous to have the extra control afforded by the extra airspeed.

Never adjust the trim setting more than ¼ of an inch at a time without flying the glider. Small changes will produce significant differences in trim.

Warning

Most of the ATOS is made of carbon fiber materials. These materials show a different breaking behavior to aluminum and steel. Most metallic materials permit some damage recognition due to their behavior of deformation. Carbon is extremely stiff and its failure mode is to shatter. From an extreme overexertion, carbon cloth can exhibit not much more than a barely recognizable crack! Other methods must be used for damage recognition, e.g. by checking rigidity, by observing cracking in places with stress concentrations, a delamination in the layers (bouncing a coin will often expose this). If you have had an extreme landing or other incident, be sure to remove the sail and inspect the area or consult your ATOS dealer.

A Bi-Annual Inspection should be performed by a Certified Dealer every 2 years or 200 flying hours. Up to then it is essential for you to accomplish the following maintenance work. If any ambiguity should arise, contact the manufacturer or your ATOS dealer.

Adjustment of the spoiler ropes

The spoiler ropes are adjusted at the factory so the control frame can be moved approx. ½-1" to each side without spoiler deployment. This should be examined before each flight. Raise the nose with one hand and move the control frame slightly - there should be 1-2" of movement without spoiler movement. Another (perhaps better method) is to have someone hold the keel level while you hold the wing level. You should be able to move one wing tip up or down 6" without either spoiler deploying. This allows straight flight without the spoilers working too often. Too much movement before spoiler deployment makes for a sloppy feel. After the first few flying hours the knots and also the rope will tighten and stretch requiring adjustment.

After adjusting the spoiler rope **also** examine and adjust the stopper rope (see below).

Adjustment and function of stopper rope

The stopper rope is in place to maintain small loads at the spoiler rib and spoiler lever. The maximum excursion of the spoilers is 80° and is limited by a rope connection between the spoiler rope and an anchor on from blowing over on it's back should you forget the bungie. The function of the stopper rope should be checked before each flight by lifting the nose of the glider while moving the control frame a full excursion of the spoiler in each direction. Also look into the sail and observe that the stopper rope is free of the d-cell. This can happen in a hard landing or by the force of your body in turbulent flight. The spoiler is attached to the spoiler lever arm with a bungie while a short, light weight line stops the spoiler knotted securely. After the first few hours of operation it will possibly require adjustment as the knots tighten.

Replacement of the spoiler rope and the nose wire/rope

The spoiler rope should be replaced at the earlier of 200 hours, the biannual inspection, or obvious wear. The nose wire/rope (it passes through the keel front and between the two side wires) must be exchanged all 100 flying hours, the biannual inspection, or any single strand break and should be examined before each flight for wear. Originally the ATOS models C, V, VX, and early VR, were shipped with a 2mm stainless wire. It was replaced with a 2.5mm zinc coated steel wire when premature wear was observed. As of October of 2005, a Dynema rope has been certified by DHV. Testing has shown it not only to exceed the strength requirements, but is far superior in wear and does not exhibit undesirable failure modes.

Examine the pulleys

The pulleys are to be checked regularly for wear. The pulleys must be low-friction.

Examination of the ribs and rib connections

The ribs can be examined visually and mechanically. Lightly squeezing the rib sides with thumbs and index fingers can easily detect a soft place in the laminate. Further testing of the rib and the connection points at the D-cell can be checked by applying a light up and down force (5 lbs. To the end of the rib in its extended position. The rib to which the spoiler lever is attached, should be checked and all ribs every 50 hrs.

Ribs and wing tip

After a landing, in which a wing tip contacts the ground, the wing tip and the outside ribs are to be checked for damage.

Main pins

The main pins should be dismantled and re-greased after 100 flying hours or after 50 flights.

D-cells

The D-cell should be examined anytime there's been large mechanical loads (hard landings) or suspicion of inappropriate transport. Within the area of the nose this can be examined with the thumbs. A soft place,

a depression, or any visual fine-line crack would be indicative of damage. This is all particularly important around the spar caps and the roving that holds the pivot points in place. Removal of the sail is necessary to allow good examination from the rear of the D-cell of the spar caps' adhesion to the D-cell. Any suspected or observable damage in any of these areas should be brought to your dealer immediately for determination of repair or replacement.

Velcro and/or belt connections at wing tip and rib cams

If the tension at the rib cams is not sufficient then the interior Velcro of the rib cam strap can be adjusted. This can be necessary particularly after the first flying hours.

If a damaged rope at the tip wand or lever is observed during setup or disassembly, it should be replaced immediately. Likewise, any Velcro that is worn and unable to hold its load should be replaced immediately.

Strap connection at the sail/keel

The belts that connect the sail and keel must be taut when the glider is fully setup. If this is not the case, then the wing has less sweep and flight characteristics are negatively affected. The tension can be affected by change in humidity or temperature. A light, taut line between the rib cams of the outermost ribs should cross the keel within 15mm of a small hole found there when the keel is parallel to the ground. Disengage the rib cams and tie the light line through their middle.

Rope connection at the flap

Examine the rope where it exits the keel for wear. Inspect every 10 flying hours.

Return bungee for the flap

If the flap does not return to contact the keel, then the associated bungee cord may need to be replaced. Other things can cause the flaps to bind and should be examined - space between the pins, binds in the flap rope, or misaligned parts.

Tail adjustment

The tail rope exits the keel at the same place as the flap rope and ties to the top of the flap line pulley. When the flap rope is just taut with the flaps in the off position, the tail rope should be just tight enough that the tail is in the full up position. This equates to the tail rope being pulled in by 5-6 inches. The result will be that the flaps go to the off position first and then as more flap rope is released the tail goes to the flat position.

Storage

Storage, like transport, requires at least three points for the D-cells to rests upon. Storage should be off the ground and in a place where condensation will not occur to stain the sail or cause corrosion to parts. The glider should be stored dry.

UV light shortens the life span of the sail and so the glider should not be left in the sun on non-flying days.

Operation limits ATOS VR

max. permissible speed of flap 0 - 15° 90 km/h
max. permissible speed of flap 70° 90 km/h
safe load factor +4 g
permissible takeoff weight 90-181,5 kg

Technical data

Span: 13,8 m
Wing aspect ratio: 13.5
Flap positions 0 - 70°
Wing area inclusive. Tail unit 14,7 m^2
Equipment weight 44 kg
Note: Use of composite construction can cause weight variations to occur.

We would be glad to hear your tips and suggestions. Further information as well as safety reports are on our homepage.

Your air team wishes you many beautiful and above all accident-free flights. Respect your new glider, learn about it one step at a time, and remember that it's more important to fly tomorrow than today.

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