AIRWAVE

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OWNERS MANUAL

MAGIC IV OWNER'S MANUAL

Congratulations on your purchase of an Airwave Gliders MAGIC IV. For a few years now the MAGIC has been the number one choice of top pilots all over the world. We believe the MAGIC IV is the finest available flex-wing glider on the market today. It achieves an exceptional performance and very good handling for many reasons. It has a sailcut that is carefully matched to the leading edge bend, a fully enclosed floating cross-tube, a large mylar reinforced leading edge pocket, and carefully engineered two-ply mylar wingtips. Drag is reduced with faired kingpost, keelpocket and uprights. These features combine to ensure a superior glide angle, an excellent sink-rate and an incredible speed range, making the MAGIC IV both a superb soarer and the best cross country glider around.

We hope your MAGIC IV will provide you with many hours of enjoyable flying. This manual has been prepared to give you information and advice about your glider. If you ever need any replacement parts, or further information, please do not hesitate to contact your nearest Airwave Gliders dealer, or get in touch with us directly.

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A FEW FINAL WORDS

1. RIGGING INSTRUCTIONS

- 1. Place the glider on the ground with nose into wind and with the zip facing upwards. Open the bag, undo the glider ties, and assemble the control frame. Check that no rigging wires pass inside the control frame triangle and check that the bolt, wingnut and ring are fully assembled.
- NOTE: There are now two ways in which the MAGIC can be rigged; either flat on the ground (with the nose catch being secured last of all), or standing on the control frame (with the nose catch being attached now). This latter method keeps the sail off the ground, but it is only acceptable in light wind conditions.
- 2. Roll the glider over so that it is the right way up and either standing on the control frame or lying flat on the ground. Ensure that the control frame is central and that the rigging wires are unsnagged.
- 3. Remove the glider bag and all the ties. Carefully walk each wing out to its approximate flying position. AT THIS STAGE YOU MUST ENSURE THAT THE KEEL AND LEADING EDGES ARE ALWAYS IN THE SAME PLANE
- 4. Raise the aerofoil kingpost and hook-in the back wires, making sure that the luff lines are untangled. It may be necessary to ease the kingpost back slightly to get the hook in.
- 5. Check the battens against the template and for symmetry. Insert the battens from root to tip with gentle pressure, until the batten meets resistance, then lift the sail at the trailing edge and gently shake in order to billow out. This enables the batten to be completely put into place over the cross-tube. DO NOT FORCE! To secure with the double elastic cords, first lift the top loop over the batten end, and then pull the knot on the bottom loop over the batten end too.
- Rotate the tip struts into position, ensuring that they are seated properly against the stop.
- 7. Install the tip battens. Look through the leading edge pocket from the wingtip and guide each tip batten onto the leading edge batten hook.

. RIGGING INSTRUCTIONS (continued)

- 8. Locate the cross-tube tensioning wires inside the keel pocket and pull on them using the goose catch as a handle. When nearing the goose catch locating channel on the keel, use two hands and peg the nose of the goose catch behind the clevis pin in the channel. With your thumb lever down the goose catch and secure it with the quickpin. ENSURE THAT THE QUICKPIN IS PROPERLY INSTALLED THROUGH BOTH HOLES IN THE CHANNEL. The batten bag and glider ties may be stowed in the keel pocket and the velcro closed. The glider bag should not be stowed in the keel pocket as this adversely affects the handling.
- Install the nose batten 'tail-end' first, from the nose of the glider, seating the front end on the keel, not on the noseplate. Close the velcro over the nose batten starting at the top and pulling along the leading edges.
- 10. If the glider has been assembled flat on the ground, lift it onto the control frame, taking care with the tip battens. Ensure that all the lower rigging wires are untangled.
- 11. Secure the nose catch. ENSURE THAT THE NOSE CATCH IS CORRECTLY INSTALLED AND FASTENED WITH THE QUICKPIN. Fit the nose cone into position over the nose and onto the velcro provided.
- 12. Carefully insert the four lower surface battens. When each batten reaches the mylar section, ease up the double surface near the leading edge and finish inserting the batten. When the batten is inserted properly the tip should be resting against the bottom of the leading edge.

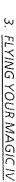
2. PREFLIGHT INSPECTION

The nature of the MAGIC IV is such that most of the preflight checkpoints common to other flex-wings are concealed to eliminate parasitic drag. A thorough preflight procedure is mandatory with all aircraft, however, and the best technique here is a circular inspection, walking around the glider.

Start at one location, the nose plate for example, and check each assembly point available for inspection. Keep in mind the THREE MOST CRITICAL set-up factors; the NOSE CATCH, the CONTROL FRAME BOLT, and the GOOSE CATCH joining the cables from the cross-tubes to the keel. As stated in the rigging procedure, ENSURE THAT THE BALL-LOCKS ON THE QUICKPINS ARE SECURE AND CANNOT PULL THROUGH.

Starting at the nose, a suitable preflight checklist would be,

- . Sight along both leading edges checking for similar curves.
- 2. Walk towards the wingtip feeling for dents in the leading edge tube.
- Pause at the wing bolt and check inside the sail through zip opening.
- 4. Continue to the tips and check the ball-tip screws
- 5. Check the tip struts.
- Walk to the keel checking the battens to ensure that they are secured properly.
- Check the luff line attachment points, both at kingpost and trailing edge grommets. Ensure that the luff lines are not wrapped around the batten ends.
- Check the cross-tube wire and goose catch connection.
- 9. Check the rear top rigging attachments.
- 10. Repeat items 2 to 7 in reverse order.
- 11. Check the nose catch.
- 12. Check all the lower rigging.
- Check that the control frame uprights are straight, and that the bolt is correctly assembled with the wingnut and ring in place.
- 14. HOOK IN and HANG CHECK.
- Instruments on, and set altimeter.



Take-off

The MAGIC IV has a neutral static balance and is very easy to launch in both calm and windy conditions. When you hold the glider prior to your take-off run, you should have the nose slightly elevated and the wings level. Again, MAKE SURE THAT YOU ARE HOOKED IN! Run hard and ease the bar out for lift-off.

Turning

The MAGIC IV has straightforward flight characteristics, typical for a defined aerofoil flex-wing. The glider can be easily directed into a turn, even at very low flying speed. To obtain the best handling characteristics and a fast roll rate it is advisable to pull in for a little extra flying speed then move to one side to enter the turn and push out slightly. The MAGIC will hold itself in a turn of a given radius and angle of bank until the turn is removed. Give yourself an extra margin of safety and DON'T fly your glider at the slowest possible airspeed when scratching for lift close to the hill.

Thermalling

This is also very straightforward. The trimspeed of your MAGIC IV is slightly faster than the speed that will give you the best climbrate in a thermal. Once you have centred on a thermal push out as much as possible without stalling. Maintain anything from 10 to 50 degrees of bank angle, depending on the nature and diameter of the thermal. The MAGIC IV will maintain a certain angle of bank and radius without further input. The MAGIC feels very good in turbulence and it does not get easily displaced even by strong turbulence. The MAGIC IV's characteristics have been optimised to give the good handling necessary for you to comfortably achieve your longest cross country flights. The MAGIC IV is probably the least tiring glider on the market to fly, because of its ideal combination of light control inputs and inertia. Flying a MAGIC IV is not hard work.

3. FLYING YOUR MAGIC IV (continued)

The 'MAGIC-TRIMMER' and Speedbar

With the optional 'MAGIC-TRIMMER' fitted, you have the enviable ability to vary the characteristics of your glider to exactly match the different conditions and requirements as you are flying. You can increase the tension on the cross-tubes to maximise your glide angle, or if a faster handling response is desired, the tension can be slackened off to suit.

For flying at speed the optional speedbar makes things easier by allowing you to comfortably move your weight further forward. It also makes normal flying more comfortable by providing a better shaped hand-grip. If your MAGIC IV is not already fitted with either of these options, Airwave Gliders or our dealers will be pleased to supply or fit them for you.

SIIBIC

When practising stalls always make sure that you have sufficient altitude. The stall characteristics of the MAGIC are very straightforward. If you push out slowly it is hardly possible to stall the glider at all, and the MAGIC will mush without a tendency to drop a wing. The sinkrate is more than doubled if you 'fly' the glider in this mode. If you push out more quickly, the nose of the glider will come up a little higher. This is followed by a gentle pitch down and the glider will regain flying speed. Little altitude is lost in this type of manoeuvre. Never stall your glider uncontrollable and dangerous manoeuvres for any tailless aircraft and may result in a tailslide, possibly with a severe tumble. Stalls in a coordinated turn are difficult to do by mistake. If you push out too much in a turn the glider will only turn more tightly, unless you are flying very very slowly in which case you may enter a spin (see Spins). NOTE: On the all-mylar and sandwich-mylar versions of the MAGIC, stalls are a little crisper and happen a bit more quickly, but new pilots will find they soon adapt to this.

3. FLYING YOUR MAGIC IV (continued)

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

anding

Landing is simple. Your final approach should be a straight glide into the wind at faster than best L/D airspeed. Bleed your speed off slowly, with wings level, and ground-skim to your chosen landing spot. In light or nil-wind conditions a full flare is required. When it is time to flare, do so aggressively and abruptly and hold the control frame out. It is possible to make relatively steep approaches to a landing area or target by 'flying' in mush mode, but this should only be done in steady, smooth winds. It is not recommended to mush the MAGIC all the way to the ground.

4. DERIGGING THE GLIDER

Folding Instructions

The procedure to fold the MAGIC IV is a direct reversal of the rigging method. Make sure that both the cross-tube tension strop and the tensioning string are free to run forward, and always close the wings before folding the kingpost. Roll the sail from the outer luff line into the mylar reinforced leading edge pocket. Put one sail tie just ahead of where the top side wires emerge from the sail, and put two sail ties ahead of the kingpost, holding the leading edge pockets overlapped.

Transportation and Storage

Avoid local hard spots pressing on the glider during transportation or storage and have as many supports as possible. Use rope or webbing rather than elastic to secure the glider, and tie both ends of the glider to a support or down onto the ends of your vehicle in order to prevent the glider flexing. It is best to keep the glider dry, so always keep it with the zip on the bag downwards and ENSURE IT IS DRY before storing.

5. MAINTENANCE GUIDE

Your MAGIC IV will require very little in the way of maintenance if you care for it properly in your day to day use. Here are some general points to follow in maintaining your MAGIC IV. Please use the Maintenance Record (see 8. Your Glider Details) for your own reference and for the benefit of any subsequent owner.

Sail

- If you must wash the sail, wash it with a light detergent only. Better still. wipe the sail down frequently with a soft, damp cloth and this will keep detergent washing to a minimum.
- Acetone or white spirit can be used to remove stubborn stains without harming the normal sailcloth. (Do not use any such solvents on a mylar or sandwich-mylar sail.)
- Rinse the sail very thoroughly after cleaning with any detergent or solvent.
- To renew the lustre of Dacron you can use a product called 'Sail Bright available from marine hardware stores.
- Apply sail repair tape to any rips or tears in your sail. This will prevent fraying on the edges where the tear is located. Do not worry about small tears extending unless they are located at stress points.
- Keep an eye on the grommets and all areas of the sail that are subject to extra stress.
- The best thing you can do for your sail is to always use the bag. Do not carry your glider on top of a car without one, even for short distances SUN AND WEATHER CAUSE MORE DETERIORATION to the sail than hours of flying. Keep your MAGIC covered when not in use.
- Be careful and precise when you repack your glider after each flight. Keep, and use, all the foam padding that arrived with the glider when it was new, and tie everything off the same way. A few extra moments when you de-rig your MAGIC will give you many extra hours of quiet and efficient flight.

Battens

When inserting battens, place them in their pockets smoothly and gently to avoid wear on the sail and batten ends. Pushing them rapidly into the pockets, or at an angle, will wear out the stitching on the edge of the pockets, not to mention possible damage to the sail itself.

5. MAINTENANCE GUIDE (continued)

Cables

Naturally if your cables contain any frays or kinks you should replace them immediately. Many experienced pilots replace their flying wires every 75 hours, regardless of wear. This is certainly worth considering. Each cable has a breaking strength in excess of 800 lbs (3500 N). Actual non-aerobatic in-flight loads will very rarely exceed 400lbs (1800 N). Inspect the thimbles; if elongation is evident then over 300-400lbs (1400-1800 N) load has been applied to the cables, ferrules and thimbles. If you must constantly set your glider up and de-rig it on rough, rocky areas, you will need to replace your cables more frequently than someone who flies the grasslands. Use your best judgement; cables are not expensive items, and they do hold your glider together.

Spars

Examine your spars for dents, wear spots, corrosion and bends during every preflight check. To maintain the structural integrity of the spars on your glider, always use a well-padded glider rack on your vehicle. Ideally the rack should support the glider in at least three places over the entire length. If a glider has been badly looked after the spars should be replaced.

Hardware and Bolts

For all practical purposes, Airwave Gliders hardware is indestructible in hang gliding (flight) applications. The bolts however, although of aircraft quality, are not designed to be indestructible and bending them even in light crashes is common. Check them periodically to be safe. Discard and replace any bent bolts. All bolts, of course, should show exposed threads above the locknut during preflight inspection.

5. MAINTENANCE GUIDE (continued)

Annual Inspection

Even if yours is the best kept MAGIC, you should have the glider stripped down for a full inspection at least once a year. This can be done by yourself or preferably by one of our professional Airwave Gliders dealers

Stripping Down

- 1. With the glider upsidedown and folded, remove the control frame from the keel and the rigging wires from the control frame.
- 2. Turn the glider over and undo the screws holding the sail to the nose.
- Pull the frame forwards a little and remove the top side wires from the cross-tubes.
- 4. Undo the black plastic lugs from the kingpost then undo the kingpost hinge bolt.
- 5. Undo the two bolts holding the keel to the noseplates and remove the top rigging with the kingpost.
- 6. The keel can now be carefully removed out of the back of the keel pocket.
- 7. Free the cross-tube tension wire from the keel pocket and double surface, and pull the rest of the glider frame forwards out of the nose of the sail, making sure that the tip struts and the main spans pull out from their holes in the sail.
- 8. Pull out the mylar leading edge reinforcement.

Inspection

Check the sail for tears and abrasion. Have any damage repaired by a professional sailmaker. Inspect all other parts for damage and replace anything that is suspect. Pay special attention to the luff lines, hangloops, and rigging. If they show ANY signs of wear then replace them.

6. TUNING THE MAGIC IV

If your MAGIC develops a tendency to turn one way, you have to check for bent battens first, and then for bent spars. If you cannot find a bent leading edge it is still possible that one of them has been stressed in a hard landing and this has resulted in slightly different bending characteristics in the two leading edges. This is not necessarily critical and the turn can be tuned out by differential batten bending.

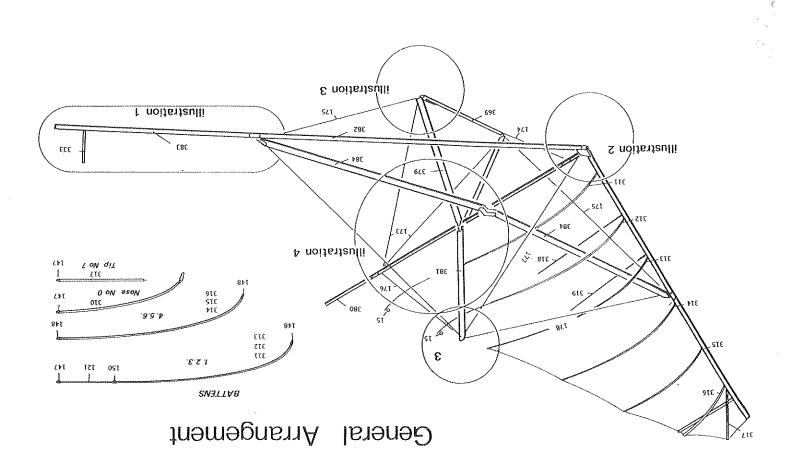
The only battens that should be changed are the two curved tip battens (nos. 5 and 6). As an example, if your glider had a right turn in it, the battens on the right hand side would require an additional camber of approximately 10 to 15mm to the slow wing, in this case the right wing. The camber of the corresponding battens on the fast wing should be decreased by about the same amount. This seems to be the best method of tuning a turn out of a MAGIC. Tightening the batten tension also has the same effect as increasing the camber. Having the batten tension slacker improves the handling, but at the possible expense of glide angle.

Pitch trim is accomplished by simply moving the hang-loop along the griptape on the keel. To make the glider fly faster, simply move the hang-loop forward. The trimspeed adjustment covers a range of about 7 mph (11 km/h). (Hang-loop all the way forward to hang-loop all the way back.) NOTE: The hang-loop on the 150 MAGIC is directly behind the control frame top box.

Changing the main cross-tube tension actually changes the nose angle and the anhedral of the glider. Increasing the nose angle WILL NOT necessarily improve the performance. In fact, over-tightening the main cross-tube tension can deteriorate the sinkrate with no advantage at high speeds. Slackening the cross-tube tension does, however, make the handling lighter.

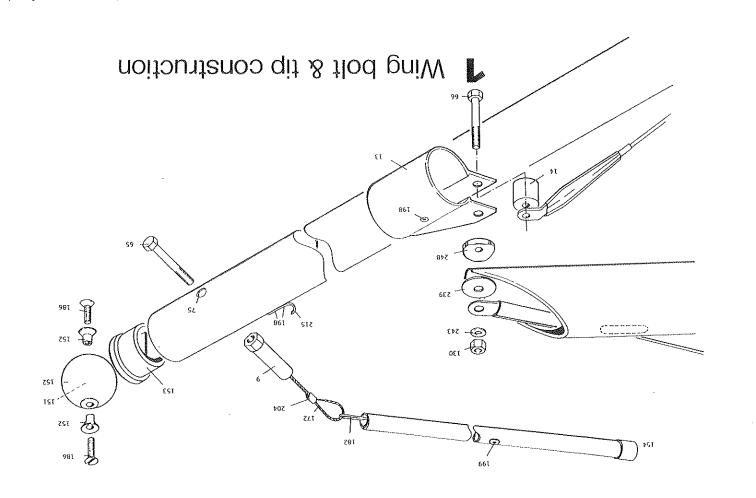
7. PARTS AND DRAWINGS

Use the following drawings to accurately identify parts for ordering any replacements you may need.



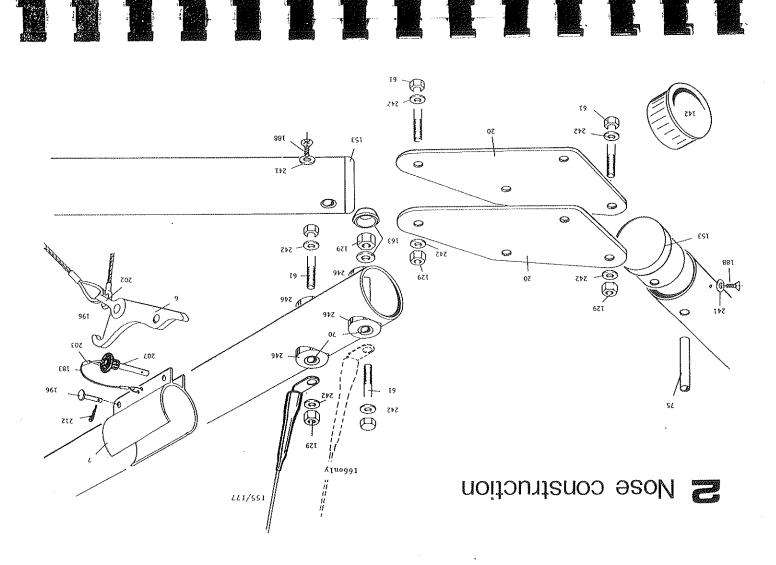
THEMEDMARKA LAFENEDT

385 386 386 386 386 386 386 387 387	MGTL MAKP MAKP MAKP MAKP MAKP MAKP MAKP MAKP	Top lateral rigging Top lateral rigging Base bar Upright King post Leading edge Inner Leading edge Outer
221 921	AT DA TT DA	Top aft rigging Top forward rigging
921	SM5A 77.00	Main span rigging
ヤムレ	FGFL.	Forward lower rigging
173	JA DA	Aff lower rigging
120	PM CS	Conn sleeves
148	T8/E DA M9	Batten tip 3/8"
L71	TS\1 DA M9	Batten tip 1/2"
121	FG 1/4*.7M	Fibreglass rod
9 L	HTJJ 3A	Leach line top hats
KEA	A38MUN TAA9	PART DESCRIPTION



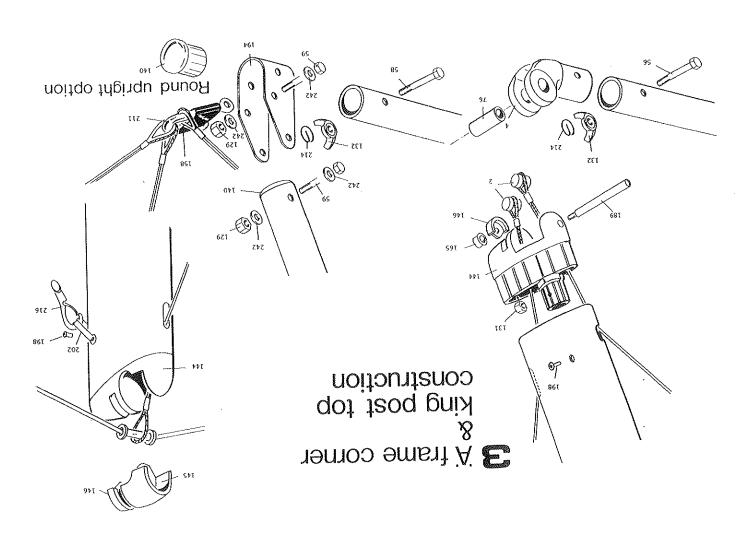
1 WING BOLT & TIP CONTRUCTION

248	65 WS AW	Saddle washer
243	8M AW	Washer
S39	"4/1 1 AW	Plastic washer
512	SF TBH 15	Tip batten hook
20 4	SEN34	Nicopress
486	SE Dee2BS	Pop rivets
198	S86890 JS	Pop rivets
186	CC e₊S2WW	Machine screws
185	BB BE tWW	Spockcord
172	HESMM	T S Wire loop
124	bw DW1/s"	TS End cap
123	SO Wel	du)
125	LM CSBS	Ball & spacer
130	. "91/9 LN	Locking nut
94	BN 3\16"	St steel bush
99	ASS 2NA TA	Bolt
99	A1S SNA TB	Bolt
た し	VF LECS	L E Clamp spacer
13	AF LEC	r E Clamp
6	∃H ∃A	Hex fitting
KEY	HERMUN IAAY	PART DESCRIPTION



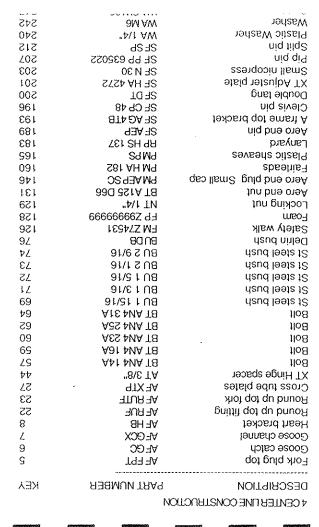
2 NOSE CONTRUCTION

21 21 22 163 163 163 203 203 203 203 212 212 242	MA SW 33 WA M6 WA M6 WA M6 SE CP 48 SE CP	Statel bush Locking nut Keel end plug Cup Mut cap Lanyard Self tapping screw Long shackle Small nicopress Shit pin Split pin Split pin Split pin Sasher Saddle washer
57 129	BN 3/16" NT 1/4"	St steel bush Locking nut
0S 61 70	PF NP BT AN4 24A "31/31 1 UB	Nose plates Bolt St steel bush
<u>/</u> 9	A DF-GC XOD-TA	Goose catch Goose channel
KEX	ABAMUN TPA A	DESCRIPTION



3.4. FRAME CORNER & KING POST TOP CONSRUCTION

-		
242	∂M AW	Washer
216	SE ÁS 20MM	Rigging hook Drilled
214	SE SB 1	Split ring
211	HSHS	Łotdeq zpackle
202	2E F2 53	roud zysckle
861	SE De39BS	Pop rivets
7 61	SF AG 4UB	M4 U Bracket
681	SF AEP	Aero end pin
991	SdWd	Plastic sheaves
891	PMDMC	Desuaggler
971	PM AEP SC	Aero end plug Small cap
971	PM AEP LC	Aero end plug Large cap
771	PM AEP	Aero end plug
071	"8/1 1 Mg	1 1/8" end plug
132	NW TN	tun gniW
131	NT A125 D66	Aero end nut
159	"4/1 TN	Locking nut
94	80 N8	Delrin bush
69	A31 4NA T8	flo8
85	91 4NA T8	Bolt
99	BT AN4 14	Bolt
7	864 국A	Fork plug base
ζ.	9AA 7A	aniq gniggir ilA
KEY	HABMUN TRA9	DESCRIPTION



Center line construction

Round

Roun

ww	ui J shtgnəl	IIA	2	
\$29L	1498	8671	(O 1 = 2 = 1)	Cross Tube Tension Wire
2276	₹60Z-	\$60Z		Front Lowers
2035	1926	1926		S19Wers
				nsq2 nisM
2855	5660	2523	507 50Z	rea2 aiold
1552	1366	9441		fiA qoT
2242	5122	5092		fnorFl qoT
9689	9259	9839	65T - 56T	Top Lateral
441	991	<u> </u>	Rigging Magic 4	

2 BICCINC

285	SF 2.5MM	əldmidT
787	SE S'2 MIBE	Wire
972	T9 TTX A M9	Plastic tube
502	SE N 3S	Nicopress
S00	2EDL	Donble tang
462	SE B.L.	Bent tang
181	FG XTT	Cross tube tension strop
87 F	JTÐA	Top lateral rigging
LL I	FIG.11E	Top forward rigging
971	AT D.R	Top aft rigging
971	SM 5H	gniggin naqa niaM
174	BC FL.	Front lower rigging
173	₽G AL	Aft lower rigging
191	LAN NK	Never kinks
69 l	PM DMD	Rigging sheath
3	SA ¬JA	Ali sheaves
2	4AA AA	aniq gniggin ilA
1	AF AFKPS	King post top slug
KEA	A38MUN TAA9	DESCRIPTION

∞ YOUR GLIDER DETAILS

Operating Limits

limitations; The MAGIC has a BHGA Certificate of Airworthiness with the following

150	155	166	177	Glider Size (approx.sq.ft)
115-140 lbs (52-64 kg)	140-160 lbs (64-73 kg)	155-175 lbs (70-80 kg)	175-200 lbs (80-91 kg)	Optimum naked pilot weight range
100-200 lbs (45-91 kg)	115-215 lbs (52-97 kg)	130-230 lbs (59-105 kg)	150-250 lbs (68-114 kg)	Recommended hook-in weight limits

pilot weight. Indicated stall speed is approximately 24mph (38 km/h) with maximum

Indicated maximum speed is 42mph (67 km/h) with minimum pilot

equivalent. weight. It is recommended that this glider be flown by a BHGA Pilot 2 or

Flight operations must be limited to non-aerobatic manoeuvres.

- This glider must not:
 --be flown by more than one person at a time.
- --exceed 30 degrees nose up or down to the horizon. --exceed 60 degrees bank angle left or right to the horizon. --be flown inverted or backwards.
- -be flown with auxiliary power.

Purchase Record

Fill this section in for future reference:

Date of purchase
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Airwave dealer [[A 1] A]

Glider serial number $\frac{A}{A}$ $\frac{A$

YOUR GLIDER DETAILS (continued)

Maintenance Record

	work carried out
	reason for work
	name
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8. YOUR GLIDER DETAILS (continued)

Maintenance Record

work carried out
reason for work
name
date

9. A FEW FINAL WORDS

Your Airwave Gliders MAGIC IV is a sophisticated high performance hang glider and will give you years of safe and enjoyable soaring, provided that you treat it properly and always keep a healthy respect for the demands and potential dangers of flying. Please remember that aviation is always potentially dangerous, and that your safety depends on you.

With proper care and maintenance your MAGIC will remain for some years at a high level of airworthiness. The MAGIC has been tested internationally to beyond all current airworthiness standards, and these represent the best accumulated knowledge of what constitutes airworthiness in a hang glider. There is much that is still unknown, such as what is the effective lifetime of a hang glider, before material fatigue and degradation compromise its airworthiness. We do know that there are forces in nature which can severely compromise your safety, regardless of the quality of design or condition of the aircraft you are flying. Your safety is ultimately your own responsibility. We strongly recommend that you fly, and in the safety margins you allow in your flying. You are reminded that you fly a hang glider at your own risk. We recommend that you always fly with a harness that has been tested for strength, and that you always fly with an emergency parachute system.

Our magazine, AIRWAVES, exists to keep the owners of our gliders informed and up-to-date about what is happening in hang gliding, and especially what is happening at Airwave. Complete and send off the registration form overleaf to make sure that you get your copies.

At Airwave, our best source of feedback is from you, the pilot. If you have any comments or suggestions, please send them to us. We are always very pleased to listen to what you have to say.

See you in the sky!

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