

Twister

Owner's Manual

Edition of 7 November 2000

**Read the owner's manual before
rigging and flying the glider!**

The logo for bauutek features a stylized arrow pointing left, followed by the word "bauutek" in a bold, lowercase, sans-serif font. The letters are filled with a halftone dot pattern.
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GENERAL INFORMATION

Congratulations on the purchase of your new Twister. You've acquired a high performance, kingpostless hang glider which belongs at the top of the list in handling and flight performance. The Twister is outfitted with the Bautek *Safety Pitch System* which automatically raises the defined tips at unstable flight attitudes, thereby enhancing washout and considerably increasing pitch.

The kingpostless Twister possesses a special deflexor construction of aluminum tubing and steel cable to absorb negative loading. This supporting crossbeam is light, easy to inspect for damage and much cheaper to replace than carbon fiber material. It also offers superior strength and stability in its function as a crossbar. The positive loading test was terminated at 846 kilopond with no residual deformation.

The glider is easy to set up with little physical effort - you'll learn to appreciate many of its construction details. The Twister is also furnished with our patented *Speed Valves* (long slots in the outer portion of the lower surface, directly behind the leading edges) which neutralize negative lift at high speed and guarantee excellent directional stability for aero-towing or high speed flight in general.

All these are advantages which pay for themselves when reselling the glider.

SETTING UP FROM THE SHORT PACK-LENGTH OF 4.1 METERS

Open the glider cover on the short-packed Twister and lay the batten quiver, the plastic wingtips and the outer leading edges aside (Illustration #1). Spread the uprights apart, lay the base tube between the control bar corners with the speedbar pointing towards the rear of the glider, and push the slotted studs into the ends of the base tube until flush. Then turn the speedbar 90° upwards until the detent buttons lock into place, preventing it from turning (Illustration #2).

Should you fly with wheels, be sure that the wheel hubs **cannot under any circumstances** press in the detent buttons on the base tube, allowing it to turn.

Turn the glider over so that it is lying on the control bar and open the rest of the Velcro straps. Unfold both sail halves to the rear and push the outer leading edge tubes into their respective inboard tubes - with left (links) and right (rechts) corresponding to the flight direction and with the tip stubs pointing inward. Check that no cloth ribs are behind the leading edges and that *SPS*-cables are not wound around the leading edges. Be sure that leading edge tubes **are pushed in the whole way and locked** (Illustration #3).

ACTIVATING THE SAFETY PITCH SYSTEM

Every production Twister is furnished with the Bautek *Safety Pitch System*. When setting up from the short pack-length, it is necessary to rejoin, on both sides, the cable connecting the defined tip hinge with its corresponding tensioning spring at the leading edge/crossbar junction. To accomplish this with a minimum of effort, bring the tensioning spring cable into reach by pulling out the nylon auxiliary cord the whole way and clamping it into the cord retainer at the end of the leading edge tube. Then snap the colored carabiner into the thimble on the tensioning spring cable. **Caution! Be sure to release the nylon auxiliary cord from the clamp when finished!** Tension from the spring pulls the tip hinge into the up position, thus activating safety pitch (Illustration #4).

PULLING THE WEBBED LOOP OVER THE LEADING EDGE END CAP

Now position the black webbed loop, located within the sail at the wingtip, over the plastic end cap of the leading edge tube by pulling on the small grey loop. Be sure that the end cap sits snugly, then **secure the Velcro straps to keep it from slipping off** (Illustration #5). Repeat the process on the opposite side.

SPREADING THE WINGS APART - INSERTING AND SECURING THE UPPER-SURFACE BATTENS

(when setting up from the long pack length, the third step after assembling the control bar and turning over the glider)

Lift up the nose and pull the control bar forward so that the glider is standing. To avoid damaging the sail, **check that no sailcloth is hanging down** between the keel and leading edge tubes before spreading out the wings. **Spread the wings out a little bit on each side until they are fully spread** - the crossbar hinders a direct spreading, since it is not fully floating (Illustration #6). **DO NOT use force to spread out or pull in the wings, you may damage the keel or sail!** If the wind is strong, it is better to do this step with the glider lying flat.

The batten quiver has separate compartments for the left and right sides of the sail - the red battens are for the left side, the green for the right (Illustration #7). Push the the nose batten into the middle pocket until the rubber tip is resting on the nose plate behind the middle bolt, then push the upper surface battens 1 to 10 into their respective pockets, beginning at the outside and working inwards. Secure them by pushing in the spring-loaded batten tips and letting them snap into the pockets in the trailing edge (Illustration #8).

When the upper surface battens have been inserted, you can tension the glider.

TENSIONING THE GLIDER

! CAUTION ! Never tension the glider lying flat! You may damage the lower side wires or the sail! If you have inserted the battens with the glider lying flat, pull up the nose and set the glider onto the control bar.

Before tensioning the standing glider, pull the wing halves as far apart as possible. An access cord runs from an elliptical opening in the keel tube into the keel pocket and back to the opening (geared down for ease of tensioning). Pull this cord out of the keel pocket (toward the rear) until the steel ring is accessible and hang it onto the metal catch on the keel by pressing in the detent button, which then locks it into position (Illustration #9).

ATTACHING THE FRONT LOWER WIRES

The front lower wires are connected to each other with a small triangle. When the glider is broken down, the triangle can be hung onto the crossbeam safety hook to keep the wires out of the way (Illustration #10). Hang the triangle onto the clamp on the bottom of the noseplate by pushing in the detent button (Illustration #11). The detent button holds it in place and must be pushed in to release it. Be sure that the nut on the triangle is screwed on tight and that the triangle shows no signs of damage after a nose-in.

CHECKING THE VG PULLEYS

When setting up, check the ease of movement of the VG pulleys by pulling out a portion of the VG cord. If it appears that too much force is necessary, insure that the VG cord is moving freely around the pulleys, and spray a little silicon spray under the front webbed loop holding the crossbeam (Illustration #12). The pulleys should also be oiled occasionally. From time to time, insure that no dirt has accumulated under the front webbed loop of the crossbeam - its freedom of movement could be considerably reduced.

ATTACHING THE CROSSBEAM SAFETY CABLE

The Twister has a back-up crossbeam connection that must be attached after tensioning the glider and released before slackening the tension when derigging. The hook must be snapped into the rear opening in the rectangular middle beam (Illustration #13).

TENSIONING THE SPREADER BATTENS

The spreader battens are folding battens at the wingtips which hook into the leading edge tubes and remain within the double surface when the glider is broken down - they generate a high degree of tension when pushed into the fully open (straight) position. Don't tension them until after the glider is tensioned, since they create even more pressure when the glider is still slack. To tension them, fold the short end out towards the rear and hook the end piece into the cloth loop at the back of the sail. Then push against the back of the joint with an **open** hand (danger of pinching !) while holding the tip with the other, until it snaps into

the fully open (straight) position. If the VG is pulled tight, the spreader battens can be tensioned with little effort, since the batten length is adjusted for tension in this position. Carry these steps out in reverse order when breaking the glider down (Illustration #14).

PUSHING IN THE LOWER BATTENS AND DEFINED TIPS

Now push the straight battens into the lower surface. These battens have no special marking, since they are easy to distinguish through their length. Their pockets are located beneath the 3rd, 5th and 7th upper surface battens (Illustration #15). Open the zippers in the lower sail beneath the defined tip hinges and push the defined tips onto the stubs within the hinges. To make this easier, hold the leading edge tube firmly with one hand and with the other push the defined tip against the stub and upward against the sail simultaneously. The transverse battens must now be snapped into the plastic ends of the defined tips and thereby secured. After closing the zippers, the defined tips are enclosed in pockets in the lower sail.

ATTACHING THE SPROGS

Open the access zippers in the lower surface between battens #6 and #7. The sprogs (long, inner washout struts – one per side) must be pulled to the rear, clipped onto the transverse battens and secured with O-rings (Illustration #16). The O-rings sit on the transverse battens and are secured by pressing them against the plastic ends of the sprogs. Then close the access zippers. The sprogs remain in the sail and have only to be detached and folded inward when breaking the glider down.

ATTACHING THE WING END CAPS

The Twister is furnished with plastic end caps which facilitate an optimum flow of air at the wingtips. **(When setting up out of the short pack length, check first to see if the Safety Pitch System is activated, that is, if the cables are hooked in and the auxiliary cords released.)** With the curvature pointing upwards, press the end cap into the opening between the upper and lower sail and secure it with the Velcro closures (Illustration #17). Repeat on opposite side.

ATTACHING THE NOSE CONE

Short zippers at the nose prevent creasing in the leading edges when the glider is folded. Before finishing the set-up by attaching the nose cone, close these zippers. Then push the nose cone onto the respective Velcro strips on the upper and lower surface (Illustration #18). **An open zipper or a forgotten nose cone could cause dangerous flight characteristics (loss of lift and weak pitch-up)! The same applies to flying with wet leading edges (higher stall speed)!**

The glider set-up is now complete!

BREAKING THE GLIDER DOWN

Disassembly of the glider takes place in reverse order, whereby you should take notice of the following:

Detach all defined tips, sprogs, spreader battens and lower surface battens before detensioning the glider. The glider can only be laid flat when tensioned **if the control bar is disassembled**. To avoid damage during transport, the middle zipper in the lower surface should always be open and the sail to the left and right of the keel pulled out when folding in the wings. Roll the sail together on each side and secure it with a Velcro strap. However, don't draw it too tight, to avoid creasing. Pull the glider cover over the standing glider and slightly close the zipper at the nose. Then turn the glider over and disassemble the control bar. *When folding in the uprights, turn the spreader bar on the hang loop parallel to the uprights to avoid damage.*

THE PREFLIGHT CHECK

Make a habit of doing a thorough preflight check before every flight. Intact equipment and a correct assessment of the weather considerably reduce the risks of hang gliding.

1. Pull the nose plate down to eye level and check the uniform curvature of the leading edge tubes on both sides and the symmetry of the glider in general. Is the small triangle with front lower wires correctly in place behind the detent button?
2. Are the zippers on the leading edges closed? Is the nose cone correctly attached?
3. Set the glider back down onto the keel and open the long zipper in the middle of the lower surface. Is the hook from the crossbeam safety cable snapped in? Do the crossbeam cables run smoothly over the pulleys?
4. Check the ease of movement of the VG and close the middle zipper.
5. Is the base tube correctly assembled? Are any thimbles twisted?
6. Are the uprights straight? Is the control bar bracket undamaged?
7. Inspect all lower flying wires for damage, especially the thimbles and Nico press fittings.
8. Push the glider forward so that it is resting on the nose. Check the defined tips and sprogs on the left side to make sure they are attached correctly.
9. Are the lower surface battens on the left side pushed in and secured? Is the spreader batten attached **above** the defined tip and tensioned?
10. Is the sail correctly pushed over the end of the left leading edge tube and secured?

11. Is the steel cable in the defined tip hinge running across the black roller?
12. Are all zippers in the cloth ribs (visual access at the sprog zippers) and lower surface as well as the Velcro fasteners between the upper and lower surface on the left side closed?
13. Is the wing end cap on the left side correctly attached with Velcro?
14. Repeat steps 9 through 13 on the right side.
15. Go to the back of the keel. Is the bolt for the lower flying wires correctly secured? Is the steel ring from the tensioning cord sitting correctly in the catch on the keel tube?
16. Is the keel pocket at the end of the sail screwed tightly onto the keel?
17. Are the main and reserve hang loops correctly fastened? Is there any indication of damage?

CHECK FROM TIME TO TIME, BUT ESPECIALLY AFTER A CRASH:

- the aluminum tubes for dents and bends as described under the heading Maintenance and Repair Instructions.
- the left and right flying wires within the double surface and the cables from the *Safety Pitch System*.
- the curvature of the battens compared to the batten template furnished with the glider.
- the ease of movement of the front webbed loop on the crossbeam.
- the sprogs (long, inner washout struts) for damage.

THE LAUNCH

Modern high performance gliders seldom have a neutral center of gravity, which means that without the weight of the pilot they are trimmed wrong and will not fly. This is also true for every manned sailplane. When launching, it's the pilot's job to accelerate his glider into stable flight. Since there is no pull on the harness at the beginning of the run, the glider tends to nose up (crossbar gliders - tail heavy) or nose down (bowsprit gliders - nose heavy) until lift is produced, and the pilot must push or pull slightly to compensate until he feels the tug on his harness. By moving the control bar bracket back behind the hang loop, we've changed the Twister from slightly tail heavy to completely neutral when resting on the pilot's shoulders. Launch the glider with the VG slack, since the maneuverability is much better in this position. Because of the *Safety Pitch System* the lower side wires are always tight, and there is no problem keeping the wings level. Begin the run slowly and accelerate smoothly until lift-off. Pull your legs up into the harness only after you are a safe distance from the hill and flying stable. Then you can close the zipper on your harness.

FLIGHT

The Twister has a variable nose angle (variable geometry, or VG), which allows an optimum sail tension for every flight phase. With a loose VG, the glider has

more washout, neutral turning characteristics and more overall stability. For these reasons we recommend flying with a loose VG in thermals and strong turbulence. With a fully tensioned VG, handling is somewhat sluggish. The Twister tends to slide inward when turning in weaker thermals, remains neutral, however, when turning in stronger ones. Sink and glide performance are approximately 10% better than with a fully loosened VG. The directional stability of the Twister is excellent at all speeds. The glider stalls at a relatively slow speed and is thereby very controllable. Although it has no kingpost hang loop, it is sensitive to small changes in bar position.

THE LANDING

The landing process begins at altitude by determining the wind direction on the ground. Once you're sure, choose your approach and hold to it. It is not absolutely necessary to loosen the VG when landing, but it is recommended because the handling is better and it is easier to flare. Fly your final with a little extra speed and let the glider use up the speed in ground effect. Wait to come up on the uprights until the glider is flying level at trim speed. **Keep your legs as far back as possible by bending your body at the small of your back** - that brings your upper body closer to the control bar and lengthens your reach when flaring. The Twister glides relatively far in ground effect and stalls gently when flaring. If the wind is calm flare actively, if strong only lightly, to come to a standing position.

TOWING

The Twister is certified for winch and for aero towing. According to the DHV (German Hang Gliding Association), the following prerequisites apply for towing:

1. Towing instruction for the hang glider pilot
2. A winch certified for towing
3. Towing instruction for the winch operator or aero tug pilot
4. A certified towline release

The Twister's excellent directional stability allows it to be towed without problems. Tension the VG somewhat to improve ground handling and to compensate for high loading during the winch tow. We also recommend this measure for aero towing. Clamp the VG cord under the rubber band on the upright to avoid tripping over it during the launch.

GENERAL REMARKS AND RESTRICTIONS

The Twister has the German Certification Number 01-318-97 and possesses the glider rating DHV 2 - 3.

The Twister may only be flown:

- by pilots with the necessary qualifications
- as a single place glider
- between angles of 30° above and 30° below the horizon in the pitch axis
- less than 60° to either side in the roll axis
- at a maximum speed of 80 kmh

**THE TWISTER MAY NOT BE USED FOR AEROBATICS OR UNAUTHORIZED
MOTORIZATION.**

The Twister was tested in January 1997 according to flight proficiency standards prevailing at that moment. They reflect the state of current technical development. This body of knowledge grows continuously and it is fully possible that physical relationships unknown until now were not taken into consideration. For that reason we recommend that you always allow a margin of safety in your choice of weather limitations and flight maneuvers.

**GETTING THE MOST OUT OF YOUR GLIDER THROUGH OPTIMUM
TRIMMING**

The pilot's center of gravity can be adjusted at the trim track by first removing the bolt on the side. Then push the plastic piece with the hang loop to the front (trim speed faster - nose heavy) or to the rear (trim speed slower - tail heavy) and fix it into position.

The sails of modern, high performance gliders are highly tensioned and therefore more sensitive in their trim adjustment. When fitting the sail, we measure it with special instruments and adjust each glider individually to make sure that it meets our tolerances. In spite of these expensive controls, it may be advantageous after awhile to alter the basic adjustment. Test the glider in light thermal activity, since changes in flight characteristics are easier to determine in moving air. It is by no means true that the tighter the sail, the better the performance. The sail tension in the direction of span can be adjusted by altering the position of the leading edge end pieces and the spreader battens. Leading edge end pieces are screwed into the middle hole on the back of the leading edge on gliders leaving the factory. The upper and lower holes can be used to adjust a glider that pulls to one side.

The glider pulls slightly to the right:

turn the right end piece flatter, that is, screw it into the upper hole.

The glider pulls slightly to the left:

turn the left end-piece flatter, that is, screw it into the upper hole.

If that isn't sufficient, decrease the curvature of the #10 batten 5 millimeters below the original curvature on the side opposite to that which the glider is pulling.

The tension on the spring-loaded batten tips is set at the factory and requires no maintenance.

On the outer leading edge there is a row of 3 holes parallel to the tube direction which allows the end pieces to be adjusted in their length. One position further toward the outside increases sail tension, one position toward the inside decreases it. At first only one side should be changed. This will not cause the glider to pull. Too much sail tension leads to bad handling, greater sink, diving turns and the tendency to pull to one side. Too little sail tension means performance loss at speed and slight instability in the pitch-axis and roll-axis.

Spreader batten tension is correctly adjusted if you can push the battens into the fully extended position **with very little force** when the glider is fully set up, but without the wing end caps, and standing on the nose **with the VG fully tensioned**. At the front of the spreader batten is a threaded adjustment with a hexagonal nut to easily vary the batten length. Too much spreader batten tension leads to less responsive handling, and to slipping in turns.

The keel pocket should be attached to the keel tube in such a way, that the distance between them amounts to 8-10 millimeters when the glider is completely set up with the VG fully tensioned and standing on the nose.

Should you decide to change any of the original settings, we recommend that you **mark the old setting**, since it is much easier to find it again if the new setting doesn't bring the expected improvement.

Call us if you are not highly enthused about the performance and flight characteristics. We'll tell you which adjustments will lead to improvement.

MAINTENANCE AND REPAIR INSTRUCTIONS

We recommend that you pack the glider short when driving long distances with it on roof racks. The short pack length is reached by simply pulling out the outer leading edges and, still within the sail, folding them inward. It is advantageous to lay the glider on an aluminum ladder or a special carrier system (TOLI, for example).

Rolling the sail too tightly in the area of the Mylar inserts or pulling the Velcro fasteners too tightly will cause creases in the sail.

A wet glider should be slightly spread out to dry, in order to avoid mildew stains.

The glider must be inspected **very carefully** after a crash. There are zippers in the keel area of the lower sail and at the outer swivel tips to enable a thorough examination. After hard crashes it is wise to disassemble and inspect the tubing. When overloaded, the tube first exhibits residual deformation, then breaks. This means that tubes which are bent have been overloaded and must immediately be replaced, since their physical structure has been damaged.

Most flying wires are prone to increased wear from rigging and derigging the glider, especially the tangs and thimbles. **Check these areas regularly.**

From time to time, the battens should be compared to the batten template to check for the correct curvature.

The length of the leading edge end pieces and the spreader battens is adjusted individually. If you replace one of these parts, **adjust the length to match that of the original part.**

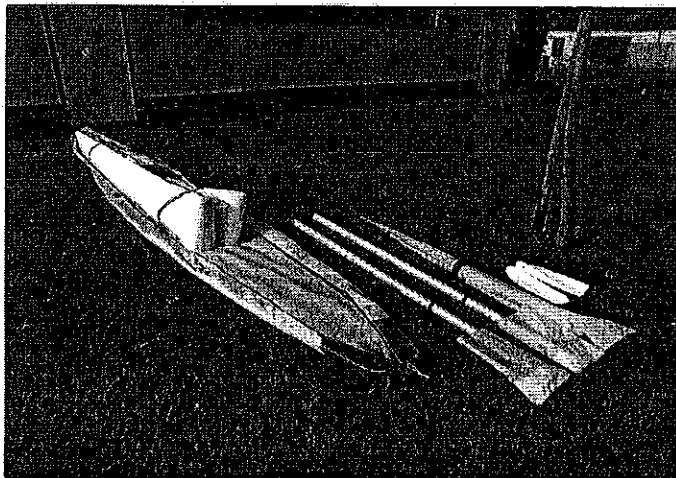
Damaged uprights can be replaced by simply pressing in the detent button at the control bar bracket and loosening the Allen screw on the control bar corner.

All bolted connections without self-locking nuts should be protected with Loctite 243. Directions for use can be found on the bottle.

Spray all zippers from time to time with silicon spray (auto accessory stores). Spots on the sail can be removed with a gentle, non-alkaline detergent. Rinse the sail cloth afterwards with clear water. Spots on the Mylar leading edge as well as residual scraps of registration numbers can be removed with a cloth dipped in acetone. **To care for the Mylar leading edge, we recommend using artificial leather spray (auto accessory stores). It keeps it pliant and protects it from bleaching by the sun.**

The Twister should be completely taken apart and checked at the factory 5 years after being manufactured. Thereafter this check should be made every 2 years.

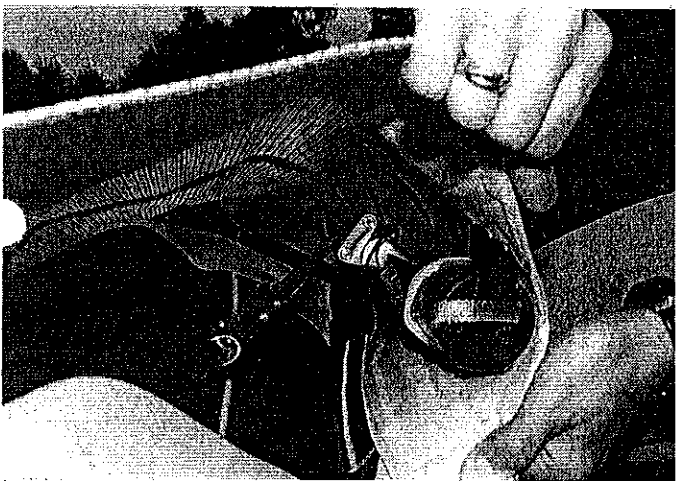
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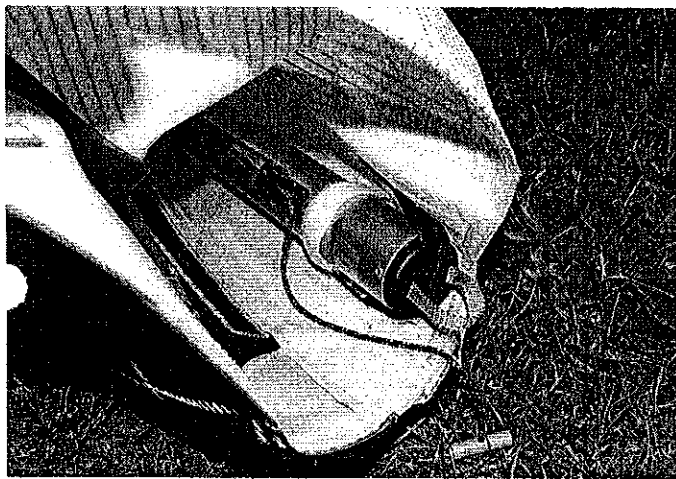
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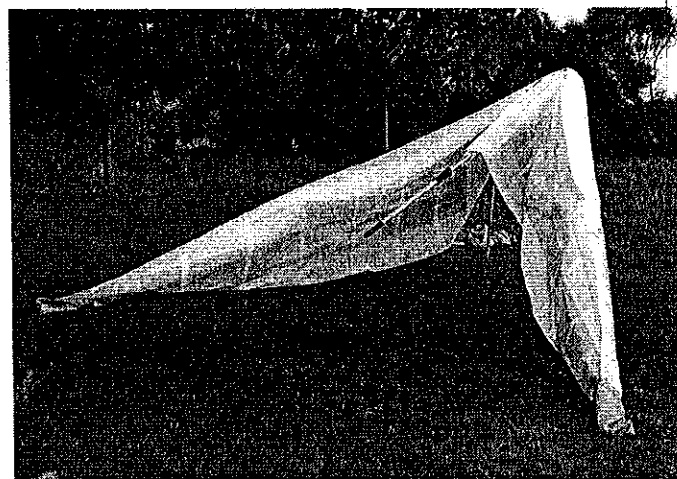
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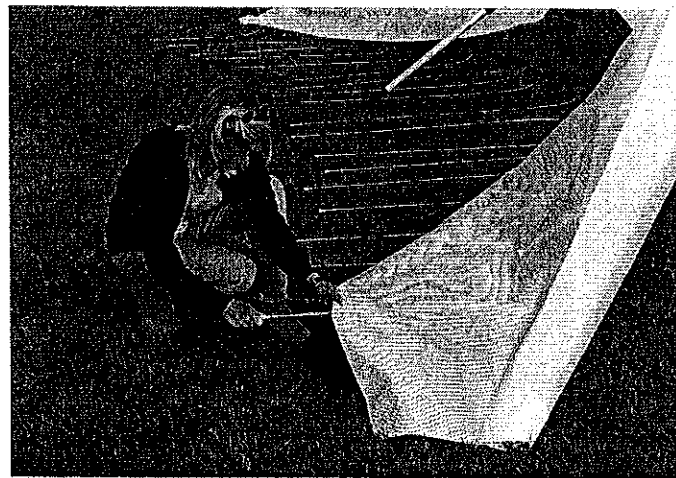
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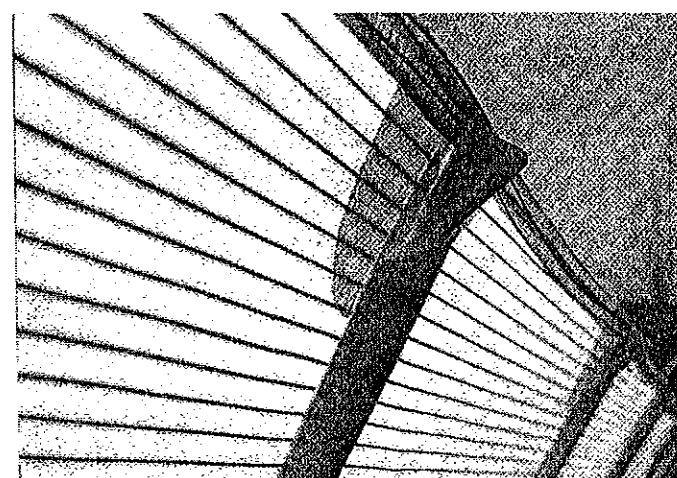
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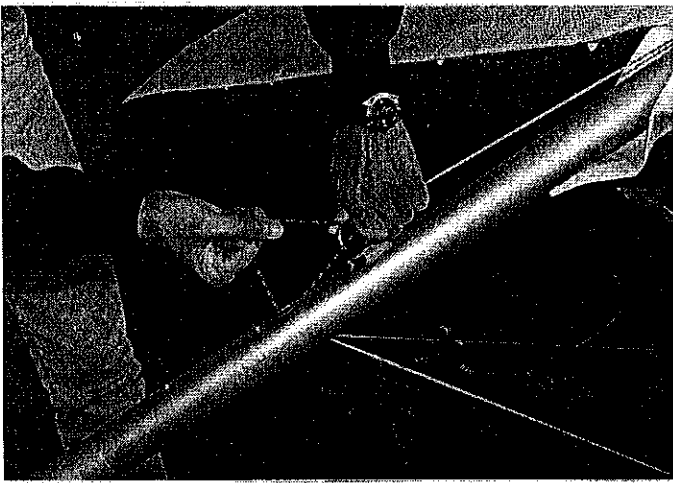
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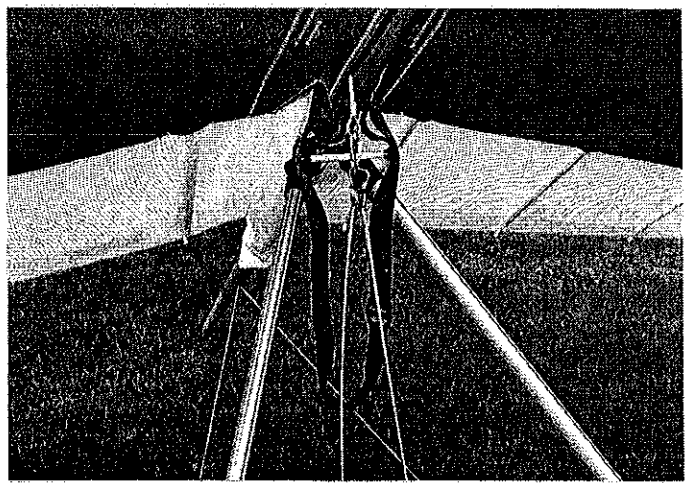
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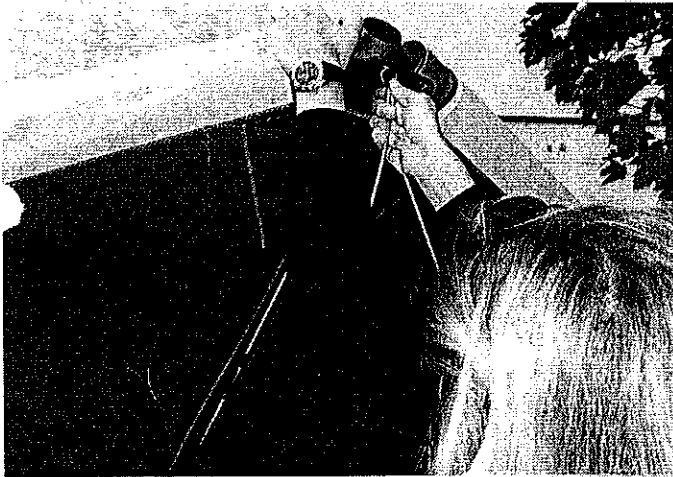
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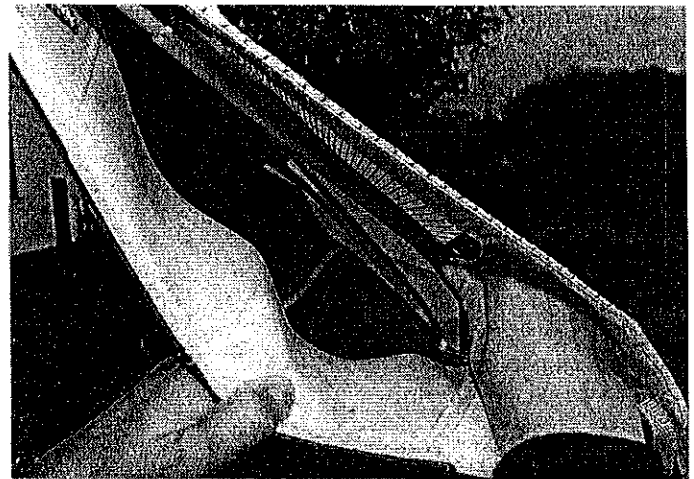
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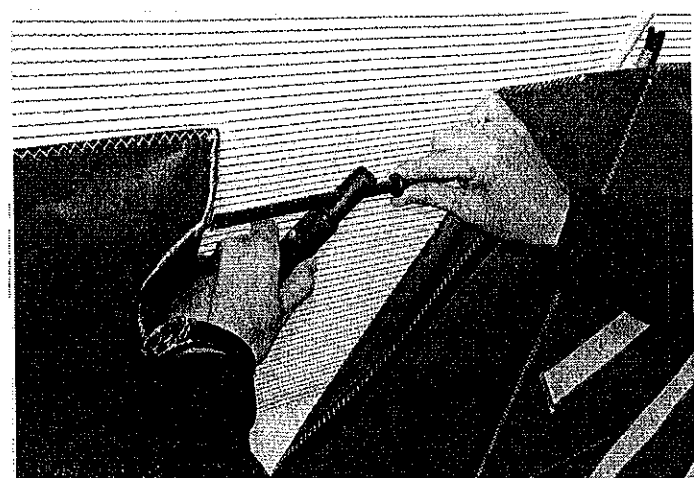
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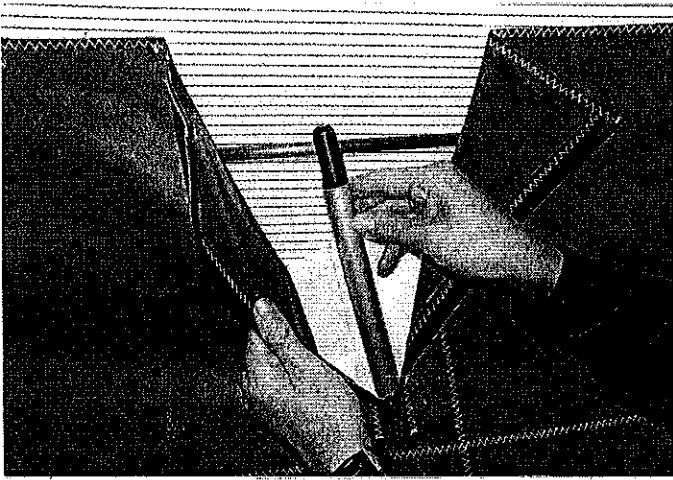
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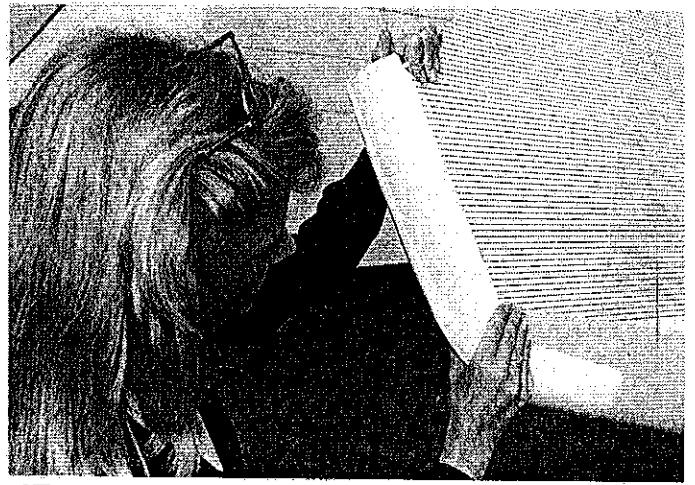
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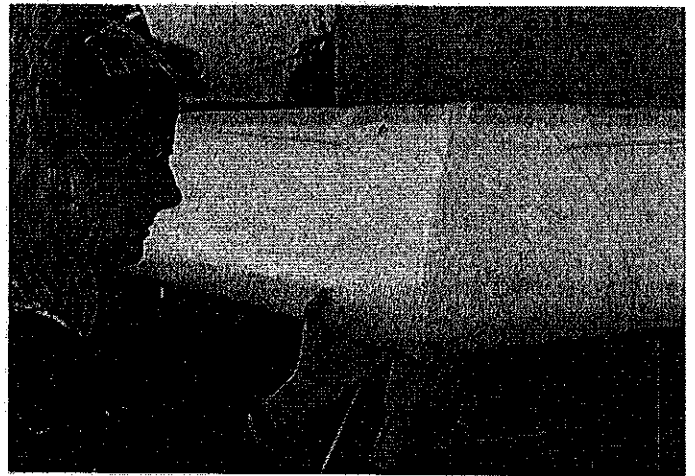
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