25/01/16 (rev-1)

CRUISER

Manual

APCO Aviation

Setting Future Standards

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WARNING

This is not a training manual. It is extremely dangerous to yourself and others to attempt to fly this or any paraglider without first completing a flying course given by a qualified instructor.

Apco Aviation's gliders are carefully manufactured and inspected by the factory. Please use the glider only as described in this manual. Do not make any changes to the glider.

AS WITH ANY SPORT - WITHOUT TAKING THE APPROPRIATE PRECAUTIONS, PARAGLIDING CAN BE DANGEROUS.

1 CRUISER TECHNICAL DATA

Size	*500*	*550*
Cells	30	32
Area m^2	46.5 (500 sq. ft.)	50.3 (541 sq. ft.)
Area (projected) m^2	38.8	42
Span (incl. Stabiliser) m	12.94	13.88
Span (projected) m	10.27	11.01
Aspect Ratio	3.6	3.83
Aspect Ratio (projected)	2.72	2.89
Payload kg	230-400	300-500
Weight of Canopy Kg	10	11
Root Cord m	4.1	4.1
Tip Cord m	1.16	1.16
Length of Lines on B m	5.69	6.09
Total length of line used m	374	401

	Material	**Diameter**	**Strength [kg]**
Top; Bottom E&F	Super Aramid	1.8mm	230
Bottom A&B; C&D	Super Aramid	3.0mm	450
Brake top; safety BR	Super Aramid	1.8mm	230
Brake Bottom	Polyester	5.0mm	
Sail Cloth		**Zero porosity "rip stop nylon"**	

GLIDER PERFORMANCE DATA	
V-min.	27km/h
V-trim	52-58km/h
Min Sink (at optimum wing loading)	1.8 m/s

2 DISCLAIMER OF LIABILITY

Taking into consideration the inherent risk in paragliding or hang gliding, (free flying and motorized), it must be expressly understood that the manufacturer and seller do not assume any responsibility for accidents, losses and direct or indirect damage following the use or misuse of this product.

APCO Aviation Ltd. is engaged in the manufacture and sale of hang gliding, paragliding, motorized Para/hang gliding and emergency parachute equipment.

This equipment should be used under proper conditions and after proper instruction from a qualified instructor. APCO Aviation Ltd. has no control over the use of this equipment and a person using this equipment assumes all risks of damage or injury.

APCO Aviation Ltd. disclaims any liability or responsibility for injuries or damages resulting from the use of this equipment.

The glider is designed to perform in the frame of the required class as certified.

3 CONSTRUCTION

The glider is constructed with a top and bottom surface, connected by ribs.

One top and bottom panel, together with the connecting ribs is called a cell.

Each cell has an opening on the front lower part. The cells fill with air forcing the panels to take the shape dictated by the airfoil (rib) section.
On either side the wing ends in a stabilizer or wing tip, which provides straight-line (Yaw) stability and produces some outward lift to keep the span-wise tension.

The front part of the ribs use APCO's FLEXON batten system to keep the leading edge shaped at high speeds and in turbulent air. They also improve the performance and the launch characteristics of the glider.

4 MATERIALS

The glider is made from tear resistant Ripstop Nylon cloth, which is P.U. coated to zero porosity and then siliconized to give the fabric high resistance to the elements. Different cloth is used for the top, bottom and ribs due to their different functions.
The lines are made of superaramid covered with a polyester sheath for protection against UV, wear and abrasion.

The bottom section of the brake lines are made of polyester because of its better mechanical properties.

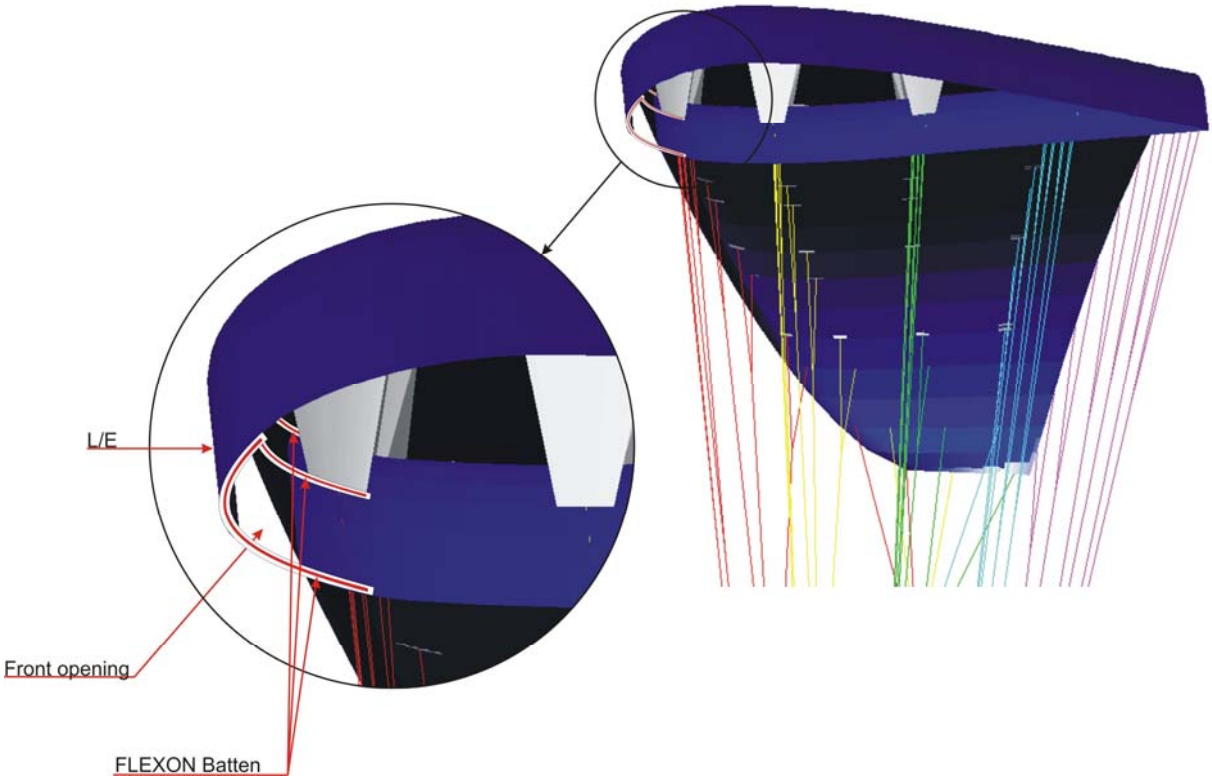
The maillon quick links that attach the lines to the risers are made of stainless steel.

5 FLEXON® Batten system:

New generation FLEXON ® batten system incorporated (see below) in the leading edge of the ribs, insuring perfect profile shape (instead of traditional Mylar reinforcement). FLEXON ® battens reduce the weight of the glider by an additional 500gr. and unlike Mylar reinforcement will guarantee no deterioration in performance or launch.

Additional advantage of FLEXON batten is that it is practically indestructible, safeguarding the performance and launch over the lifespan of the glider.

How it Works:

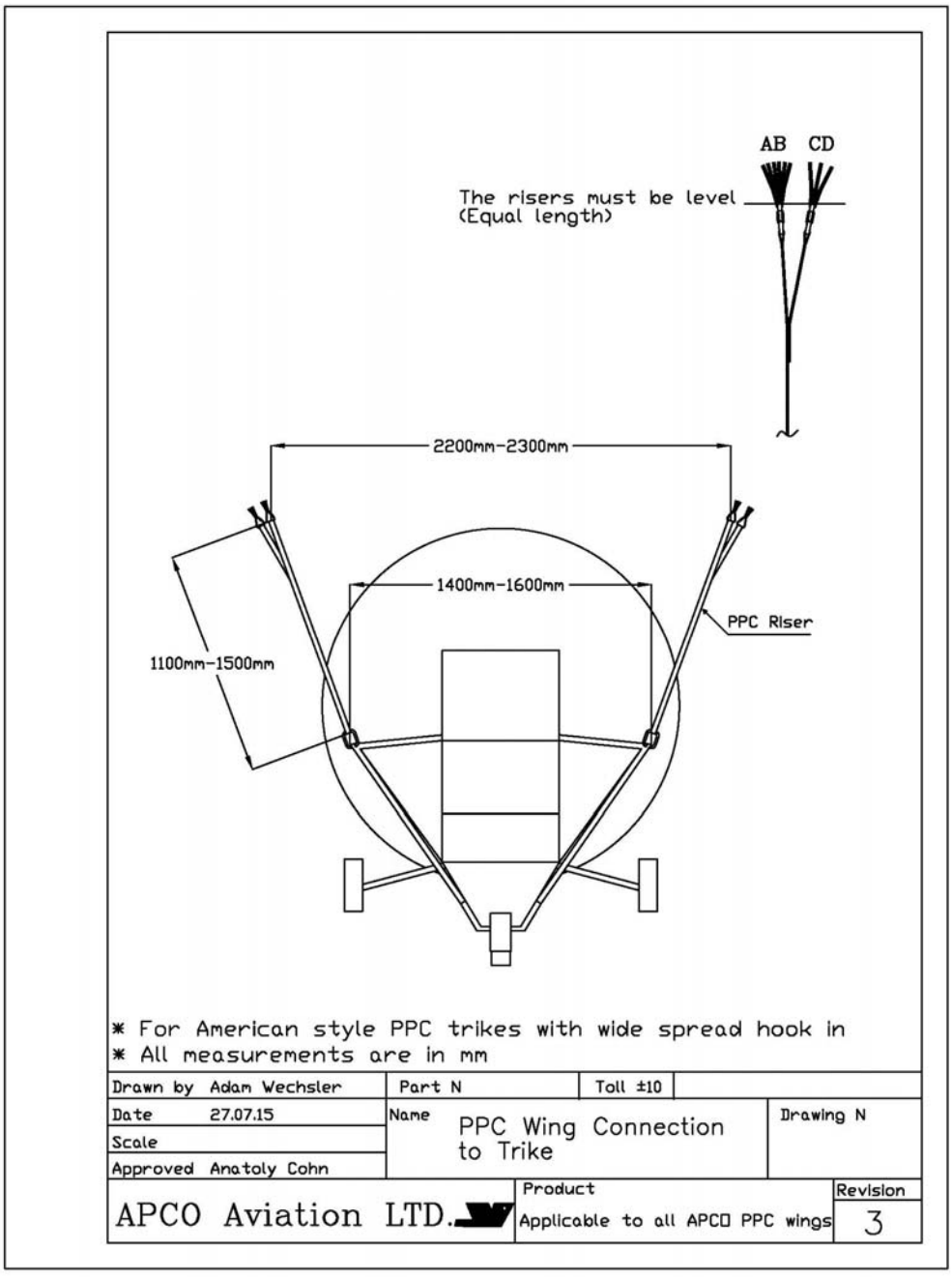


6 TRIMMING

All Apco gliders are trimmed for optimum performance combined with unsurpassed safety. It is very important not to re-trim or tamper with any of the lines or risers as this may alter the performance and safety. Trimming of the brake line should be done in accordance with this manual and carefully checked before flying.

7 RISERS:

The CRUISER is designed for a standard PPC (trike) configuration, with a 140-160 cm distance between the base of the risers and should be using the standard risers of the PPC (trike) manufacturers. For further information contact your PPC manufacturers (trike).



8 INSPECTION

8.1 GENERAL

Pilots, please insure that your wing has been test flown and fully checked by your dealer before taking it into your possession.
Verify that the dealer checked and confirms that the glider is airworthy.

8.2 QUIK LINK SAFETY INSTRUCTION

Tightening torque of nut: 1,20 [NM] – Secure the nut with a drop of "Loctite" glue.

8.3 BRAKE SETTING

The CRUISER is supplied with brake safety line (brake line measurement setting line). In order to set the correct length of the brake after connecting the CRUISER to the PPC and rigging the brake line through the intended pullies on the machine, use another hand to hold the brake lines together pulling away from the PPC till the safety line is tight, adjust the main brake line in accordance to this length and fix it to that position.

NOTE:

- **It is very important that the brake line is set to the correct length (first few centimetres of the brake are fairly light, while still functioning).**
- **If the brake is set too short, it will result in delayed inflation and the glider will not come over head as easily. If set too long there will be a slack of the controls and will not function as intended.**
- **DO NOT trim off the safety brake line as it will be very helpful when re-assembling the wing after periodical check, changing between machines.**
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8.4 FIRST CHECK AND PREFLIGHT INSPECTION

With every new wing, the following points should be checked:
• Connection points between the wing and the trike.
• Check that there are no lines twisted, tangled or knotted.
• Check that the risers are hooked up to the trike correctly.

8.5 REGULAR INSPECTION CHECKS:

Following are the wing inspections provided by the manufacturer, however further inspections must be made of the entire flying machine before taking off.

• Damage to lines, webbing and thread on the stitching of risers.

• The stainless steel connection links on the risers are not damaged and are fully closed.

• The sewing and connection of the lines.

• Damage to hook up points on the wing.

• Internal damage to the ribs.

• Damage to the top and bottom panels and seams between panels.

8.6 LINE MAINTENANCE

Several groups of suspension lines and one brake line are attached to each riser. The groups are called A&B, C&D and brake lines.

Superaramid lines are known to be sensitive to the influence of the elements. They must be carefully inspected periodically. In his/her own interest, the pilot must observe the following points to ensure maximum performance and safety from the wing.

• Avoid sharp bending and squeezing of lines.
• Take care that people do not step on the lines.
• Do not pull or jerk the lines if they are caught on rocks or vegetation.
• Avoid getting the lines wet. If they do get wet, dry them as soon as possible at room temperature and never store them wet. Never fly with wet lines as their tensile strength will be temporarily reduced.

IT IS **STRICTLY RECOMMENDED** TO CHANGE THE BOTTOM LINES ON EVERY PARAGLIDER ONCE A YEAR OR EVERY 100 HOURS, WHICH EVER COMES FIRST. THE REST OF THE LINES MUST BE CHECKED YEARLY AND REPLACED IF NECESSARY. THIS RECOMMENDATION IS IN LINE WITH ISRAELI REGULATIONS, BINDING IN ISRAEL. AS AN ALTERNATIVE, WE SUGGEST FOR YOU TO FOLLOW THE REGULATIONS SET BY YOUR NATIONAL AUTHORITIES WITH REGARD TO LINE MAINTENANCE AND REPLACEMENT.
NEVER REPLACE THE LINES WITH DIFFERENT DIAMETER OR TYPE OF LINES AS ALL WINGS WERE LOAD TESTED FOR SAFETY IN THEIR ORIGINAL CONFIGURATION. CHANGING LINE DIAMETER/STRENGTHS CAN HAVE FATAL CONSEQUENCES.

For replacement lines please refer to our online direct line services

Every six months one A&B and one C&D line must be tested for minimum 45 % of the rated strength. If the line fails under the load test or does not return to its specified length all the corresponding lines must be replaced (e.g. if the line is rated 100 kg. it must withhold 45 kg. or more)
Professional use of wings: Schooling and competition flying requires more frequent line inspection and replacement of A&B, C&D and brake lines.

8.6.1 LAYOUT

Pre-flight check should be done before every flight.

Spread the wing on the ground. Spread the lines, dividing them into groups A&B, C&D and brake lines left and right. Make sure the lines are free and not twisted or knotted.

Make sure all the lines are on top of the wing and none are caught on vegetation or rocks under the wing. Lay out the wing in a horseshoe shape. This method insures that all the lines are equally tensioned on launch, and results in an even inflation.

The Flexon rib reinforcements will keep the leading edge open for easy inflation.

The most common reason for a bad launch is a bad layout!

8.6.2 ASYMMETRIC COLLAPSE

If one side of the wing partially folds or collapses it is important to keep your flying direction by applying weight shift and some brake on the opposite side.
The wing should re-inflate on its own without any input from the pilot.
To help re-inflation it is possible to apply some brake on the collapsed side and release immediately.
In the event of a big deflation, i.e. 70%, it is important to apply brake on the inflated side of the wing, but care must be taken not to apply too much as you could stall the flying side.
The wing is very solid and has a strong tendency to re-inflate after collapse.

8.6.3 FRONT STALL OR SYMMETRIC COLLAPSE

In the event of a front stall the wing will normally re-inflate on its own immediately without any change of direction. To speed up re-inflation briefly apply 30%-40% brake (to pump open the leading edge). **Do not hold the brakes down** permanently to avoid an unwanted stall.

8.6.4 SPIRAL DIVES

The CRUISER has very good behaviour in spiral and has no tendency to stick in the spiral. By progressively applying brake on one side the wing can be put into a spiral dive. Safe high sink rates can be achieved like this. The spiral has to be exited slowly by releasing the brake over one complete turn or the wing may pitch forward and possibly suffer a collapse.
Care must be taken that the pilot has enough height to exit the spiral safely.
Sink rates in excess of 19m/s can be obtained.

CAUTION:
SOME WINGS CAN BE NEUTRAL IN SPIRAL AND MAY NOT EXIT WITHOUT PILOT INPUT. TO EXIT A NEUTRAL SPIRAL THE PILOT HAS TO APPLY BRAKE INPUT TO TURN OUT OF THE SPIRAL (ON THE OUTSIDE WING). AS SOON AS THE WING STARTS TO SLOW DOWN IN THE SPIRAL THE OUTSIDE BRAKE MUST BE RELEASED.

PILOTS CAN SUFFER BLACK OUTS IN SPIRALS AND THE PILOT HAS TO EXIT THE SPIRAL AS SOON AS he/she FEELS ANY ABNORMAL SYMPTOMS (Black dots in field of vision or light-headedness).

8.6.5 STRONG TURBULENCE

NEVER FLY IN STRONG TURBULENCE!

If you unexpectedly encounter strong turbulence, fly with about 20% brake applied to increase the internal pressure and the angle of attack of the canopy and land as soon as possible.

8.7 TAKE-OFF

8.7.1 LAUNCH

Please check wind direction, even when it seems that there is no wind at all, there is always some drift.
Therefore be careful in determining the conditions, since in PPC flying it is most important that the launch and initial climb are performed with a head wind (the danger of losing your airspeed while crossing the wind gradient is greatly reduced).
Special attention must be paid to trees, power lines and other obstacles, including the possibility of emerging rotors.

Launch preparation
Lay out the wing in an arc, downwind of the power unit, with all suspension lines taut and pointing toward center of the power unit.

Now have quick checks if:

- Helmet is on and fastened for both passenger and pilot.
- Passenger and pilot have fastened the belts properly.
- The risers are properly connected and laid out.
- The brakes are pulled to the neutral position and laid out so they are not caught on the frame.
- Propeller is clear.
- The engine delivers full power.
- Take off area is clear of obstacles and free to use.

8.7.2 Take off procedure:

- Open the throttle continuously at a rate that when the lines are fully straightened the throttle is at the position of 50%-100% depending on your PPC, some experience is how ever required to get the proper judgement. And let the canopy climb above your head.

CAUTION:
THE CRUISER HAS A GREAT LIFTING CAPACITY, THUS GIVING MORE THROTTLE CAN LIFT THE MACHINE BEFORE REQUIRED.

- When the canopy is above your head, reduce the throttle to about half of the range, check the canopy and center it above your head if necessary.

  NOTE: If throttle was eaised off too early or, too much brake applied during the inflation, or not enough power being used, the wing can get stuck behind at an of 50-70 degrees. In that case ease off the throttle completly, the wing drop back to the ground and then re-inflate.

- Recheck if take-off is clear, open the throttle fully and take off.
- Do not try to take off until your wing is overhead. Hitting power before that can cause dangerous oscillations.

8.7.3 CLIMBING

Once you are safely airborne, continue heading against the wind, using brakes to correct the direction.

Do not try to climb too steeply.
In a flight the CRUISER behaves more like an airplane than a paraglider, and it is good idea to regard it as such. If there are no obstacles present, it is by far safer to fly level for a while after take-off, clearing the ground gradually, gaining some speed before converting it to height with a brief application of brakes.
Another reason to avoid climbing too steeply is the risk of engine failure at low altitude.

You should always be able to land safely in case of engine malfunction, so it's better not to take unnecessary risk and always fly with a safe margin of speed and height.

Depending on the power unit geometry, it is possible that after take-off you will notice a propeller torque (known as P-factor).
It will try to turn you around, so counter-steer with a brake.
When climbing steeply with high power output, beware of the possibility of stall.
Due to considerable vertical distance between thrust axis and wing chord - the range of safe power operation is closely associated to your skills and equipment.

Power-unit induced oscillations:
Certain configurations of engine weight, output and propeller diameter can cause oscillations, during which the pilot is being lifted to one side by the torque effect, swings down due to his weight, and then is lifted again and so on.

To avoid this you can:

- Change the throttle setting.
- In addition pilot reactions can often be wrong or come too late, increasing the problem instead of solving it.
- In this case the safest way to deal with this question is to close the throttle and release the brakes.
- Less-experienced pilots especially tend to overreact.
- This is called a pilot-induced oscillation, and the proven solution is to **leave the brakes alone**.

8.8 LEVEL FLIGHT

Check your altitude regularly on your flight instruments (do not just concentrate in the cockpit on all times, since obstacles might just appear out of no-where).
In level flight it is very easy to start climbing unintentionally.
The instrument will help you optimize speed and fuel economy.
Of course each flight depends on configuration of your gear, but due to CRUISER's ability to fly safely without constant piloting, it will let you adjust everything to the best effect.

8.9 LANDING

8.9.1 POWERED LANDING :

Make a flat approach with the engine idling, then level out and lose the speed before final flare.
Immediately on landing, switch off the engine.
The main advantage of this procedure is the possibility of going around with the wing again (repeating the approach) if anything goes wrong.
If you forget to switch off the ignition before the wing falls down, there is a considerable risk of damaging propeller, catching lines in it.

8.9.2 POWER OFF LANDING (emergency landing):

In case of an engine failure glide towards a landing zone, try to aim towards the centre of the landing field, as there is no possibility of opening the throttle and going around.
At the altitude of 1-1.5meters, flare the wing, in a rate that when reaching the ground the sink rate is approximately 0m/s.

Remember:

- Whenever possible, get to know the landing field before taking off.
- Check the wind direction before planning the approach.
- Landing with power off requires much less space.
- In case of any doubt, practice the landing until you feel totally safe
- Never place the power unit downwind of the wing.
- Check, double check and then check once again that there is no fuel leakage.
- Do you have enough fuel for the flight? It is always better to have too much than too little!
- Check that there is nothing loose in that could possibly contact the propeller in flight.
- Whenever you encounter a problem, fix it **AT ONCE** however small it is!
- Always put on and lock helmet before getting buckled.
- Before each launch run a full pre-flight inspection.
- After landing, continue to maintain the wing's direction straight, as on turning you always risk getting lines in the propeller.
- Turn only if there is danger.
- Do not fly over water, between trees or power lines and other places where engine failure will leave you helpless, always make sure you have possibility for emergency landing.
- Mind the turbulence caused by other wings or even by yourself, especially when flying low.

- In general never trust your engine, as it can stop at any moment. Always fly prepared for engine failure.
- Do not fly with tail wind at low altitudes, it narrows your options !
- Do not wait for the problem to grow - any change of engine sound or a vibration may indicate a problem. You'll never know until you land and check it out!
- Be certain of your navigation
- Remember that not everyone is fond of your engine noise.

9 PACKING

Spread the wing completely out on the ground. Separate the lines to the left and the right side of the wing.

Fold the canopy alternately from the right and left sides, working towards the centre, press out the air, working from the rear towards the front. Fold the canopy as a pile and press the air out.

10 MAINTENANCE & CLEANING

Cleaning should be carried out with water and if necessary, gentle soap. If the wing comes in contact with salt water, clean thoroughly with fresh water. **Do not use solvents of any kind**, as this may remove the protective coatings and destroy the fabric.

11 STORAGE

When the wing is not in use, the wing should be stored in a cool, dry place. A wet wing should first be dried (out of direct sunlight). Protect the wing against sunlight (UV radiation). When on the hill keep the wing covered or in the bag. Never store or transport the wing near paint, petrol or any other chemicals.

Do not leave your paraglider in the trunk of a car or exposed to the sun.
Temperatures on a hot summer's day in a closed environment: car, etc. can easily reach over 60ºC
At these temperatures Nylon permanently changes its characteristics which may alter the behavior and shape of the wing.
It will cause permanent damage to the paraglider, rendering it non-airworthy. APCO's warranty will not be applicable.

12 DAMAGE

Using spinnaker repair tape (for non-siliconized cloth) can repair tears in the wing (up to 5cm). A professional repairer should repair greater damage.

13 GENERAL ADVICE

A qualified person or agent of the company should check the wing every year.
The wing is carefully manufactured and checked by the factory. Never make changes to the wing or the lines. Changes can introduce dangerous flying characteristics and will not improve flying performance.

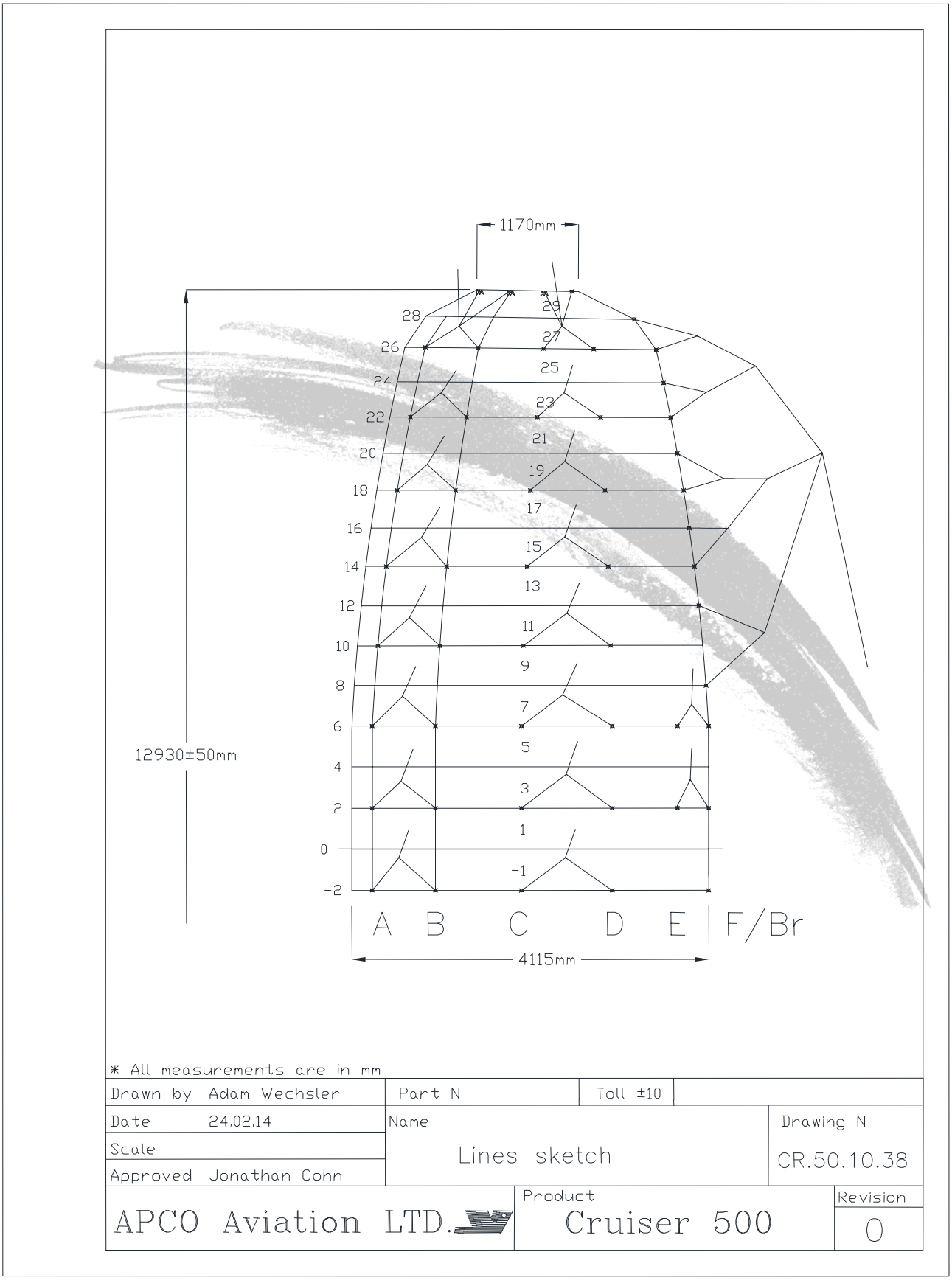
Do not put the wing in direct sunlight when not necessary. In order to protect the wing during transportation or waiting time we recommend one of our lightweight storage bags.

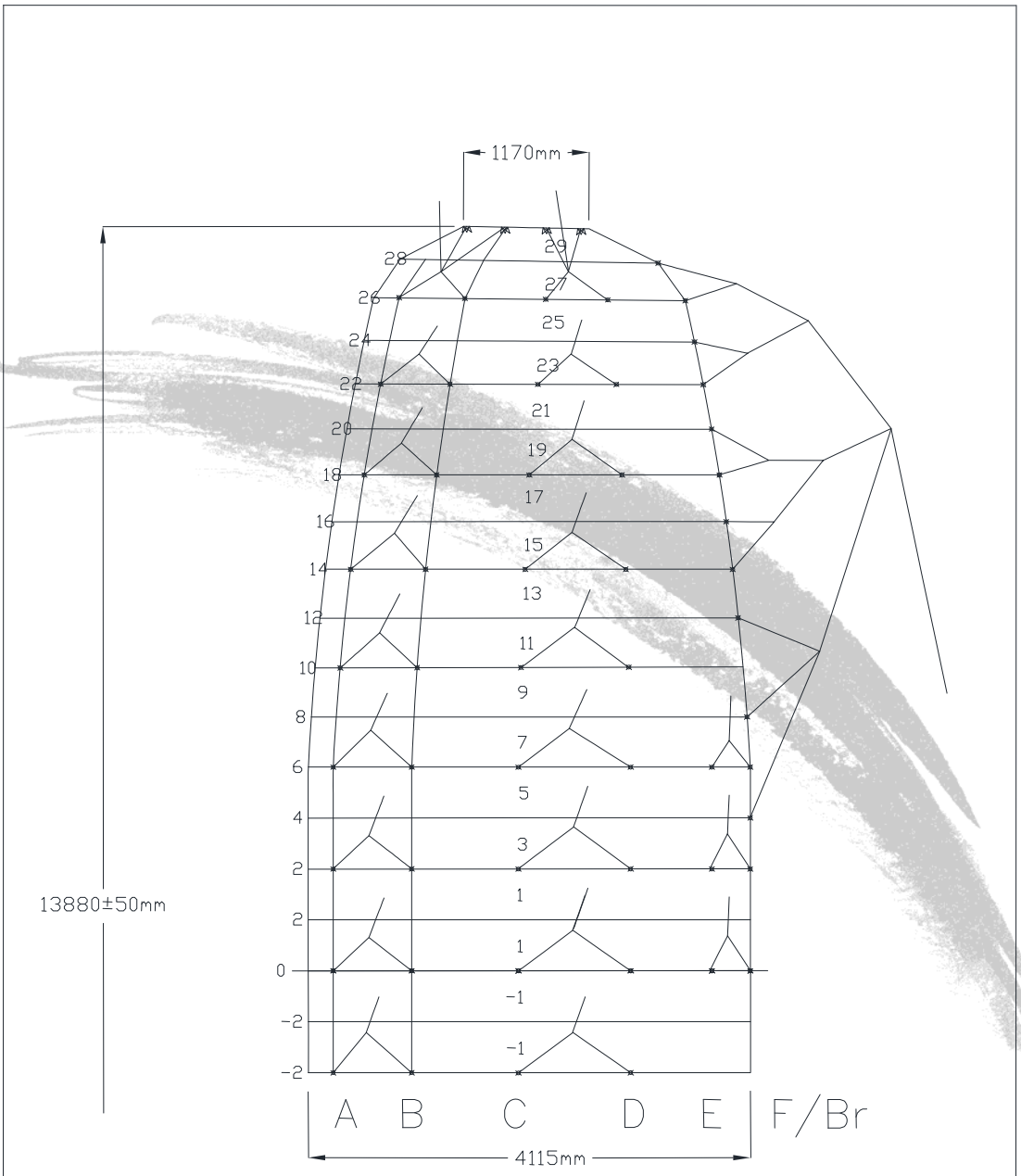
If you have any doubts about flying conditions - do not begin.

If you have any questions, please contact your dealer or us.

Lastly, be equipped with a certified emergency parachute and helmet on every flight.

13.1 DIAGRAMS:





* All measurements are in mm

Drawn by Adam Wechsler	Part N	Toll ±10	
Date 24.02.14	Name		Drawing N
Scale	Lines sketch		CR.55.10.38
Approved Jonathan Cohn			
APCO Aviation LTD.	Product Cruiser 550		Revision 0

APCO wishes you many hours of enjoyable flying.

Take Air!