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# ***HYBRID***

# ***Manual***



**APCO Aviation**  
*Setting Future Standards*

Factory: 7, Chalamish Street - Industrial Park - Caesarea 38900 ISRAEL [www.apcoaviation.com](http://www.apcoaviation.com)  
Tel: +972 4 6273727 Fax +972 4 6273728



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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 HYBRID

The Hybrid is a new category of wing in our sport, with unprecedented flying characteristics. This unique design combines a classic double surface profile with a single surface profile, together creating a hybrid profile.

The Hybrid is much more than an exotic wing for special purposes. This version is intended for Solo Flying. It offers many advantages over single skin designs and also classic wings in beginner to sport categories.

The Hybrid is light (3 kg), but not designed to be a "Lightweight" wing.

The absence of bottom surface on the back part of the wing saves weight but is also what makes it fly in such a special way.

The profile that results from this design gives unparalleled stability in both roll and pitch.

## Profiles comparison

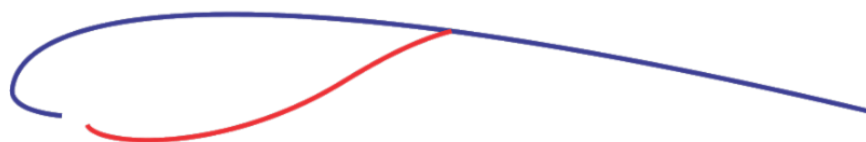
### Classic



### Single skin



### Hybrid



Top surface 

Bottom surface 





## 2 Flight Characteristics

**Pitch stability** - this is immediately noticeable when kiting the wing, if you try to create "dolphin" movements in the air you will understand exactly what we mean! The Hybrid has enough air mass and inertia to penetrate through the air rather than being controlled by the air. Contrary to a Single Skin, you are not tossed around by the currents. the pilot is in control and will enjoy strong thermal conditions!

**Roll stability** - especially dominant with a paramotor - this wing is more roll stable than anything out there. With this wing, there will be NO roll oscillation what so ever!! When free flying, the pilot will notice that it is "hard" to perform wing-overs. This is due to the increased roll stability of this wing.

**Brake pressure** - pleasantly low! On a classic profile, the brakes need to be applied against the internal pressure of the wing. With the Hybrid, as with single skin designs the brakes create only drag and therefore are much more efficient. This wing feels accurate and precise, the brakes are progressive and constantly transmitting the air around you.

**Take-off** - Take-off speed is surprisingly slower than most EN A wings. This helps tremendously in "not perfect" take-off conditions. Back-wind of 3-5 [kmh] is not a problem with the Hybrid (common in Hike & Fly take-off spots). Same goes for front launches with a paramotor, few steps and you are airborne. Inflation is as on superlight single-skin wings, it will come overhead and stay there even in the lightest breeze imaginable!

**Flare** - Contrary to single skin wings, the Hybrid flare is superb! Due to its high stall resistance and long brake travel, it flares like an EN-A wing!

**Hike and fly** - Coming in at only 3 kg including standard webbing risers (not flimsy rope risers!).

Add to this the ease of take-off at nil wind or even back-wind, and it's perfect for hike and fly. It has better performance than a single skin with proven Safety - A across the board and B on only 2 maneuvers. (B rating for only the Front stall and 75% side collapse flying at full speed bar at maximum weight)

**Thermalling** - Hybrid thermals like the wing is "stuck" in a banked position turning and pulling itself into the core.

The wing thermals in such a natural way partially due to the intensely high roll stability. In general, flying the Hybrid feels like the wing is "taming down" the conditions. 7 [m/s] thermals, will feel like 4 [m/s] with calm and peaceful behaviour.



### 3 HYBRID TECHNICAL DATA

Size	Small	Medium	Large	X Large
Cells	48	48	48	50
Area m <sup>2</sup>	20	22	24	25.56
Area (projected) m <sup>2</sup>	16.9	18.6	20.3	21.65
Span (incl. Stabiliser) m	10.1	10.6	11.0	11.59
Span (projected) m	7.9	8.3	8.6	9.06
Aspect Ratio	5.1	5.1	5.1	5.25
Aspect Ratio (projected)	3.7	3.7	3.7	3.79
Pilot Weight, Kg (all up) PG	55-75	70-90	85-105	100-120
Pilot Weight, Kg (all up) PPG	70-95	85-110	100-125	115-140
Weight of Canopy Kg	3.0	3.1	3.2	3.25
Root Cord m	2.43	2.54	2.65	2.65
Tip Cord m	0.43	0.45	0.47	0.47
Length of Lines on B m	6.06	6.35	6.64	7.10
Total length of line used m	315	324	333	352

LINES					
	Material	Manufacturer	Type Code	Diameter	Strength
Top	Dyneema	Cousin	TopLine 12250	1.0	90
Brake Top, St Top	Vektran	Cousin	Vectraline 12100	0.6	50
Mid & Brake Mid	Vektran	Cousin	Vectraline 12240	0.9	115
Bottom St	Superaram	Cousin	Technoline 1320	1.0	137
Bottom A,B,C	Superaram	Cousin	Technoline 1590	1.4	254
Brake Bottom	Dyneema	Cousin	CTL910190	2.0	230
FABRIC					
Sail Cloth				"Zero Porosity" Ripstop Nylon	
Warranty*				1 Year / 100 hours	

#### GLIDER PERFORMANCE DATA

V-min.	22 km/h
V-trim	35 km/h
V-max.	47 km/h
Min Sink ( at optimum wing loading)	1.1 m/s

### 4 HYBRID CERTIFICATION DATA

#### CERTIFICATION DATA – Flight Test Configuration

SIZE	Harness to riser		Distance between risers		Test Weight Low / High		Brake Range at Max Weight	Certification EN / LTF
S	43	40	40	44	55	75	>56cm	B (pending)
M	43	43	44	46	70	90	>60cm	B (pending)
L	44	43	44	46	85	105	>64cm	B (pending)
XL	-	-	-	-	-	-	-	Uncertified

\*Refer to Warranty Certificate Supplied with your wing.





## **5 DISCLAIMER OF LIABILITY**

Taking into consideration the inherent risk in paragliding, 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.

## **6 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 aerofoil (rib) section.

On either side the wing ends in a stabilizer or wing tip, which provides straight-line (Yaw) stability and produces some outward force to keep the span-wise tension.

The front part of the ribs uses 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.

The line hook-up points are made of Dyneema and imbedded in the bottom surface of the wing for minimal drag and maximum performance.

## **7 MATERIALS**

The glider is made from "Zero Porosity" Ripstop Nylon, which has 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 unsheathed superaramid / Vektran.

The bottom brake lines are Dyneema with a polyester sheath, which has excellent mechanical properties.

Dyneema Softlinks attach the lines to the risers.

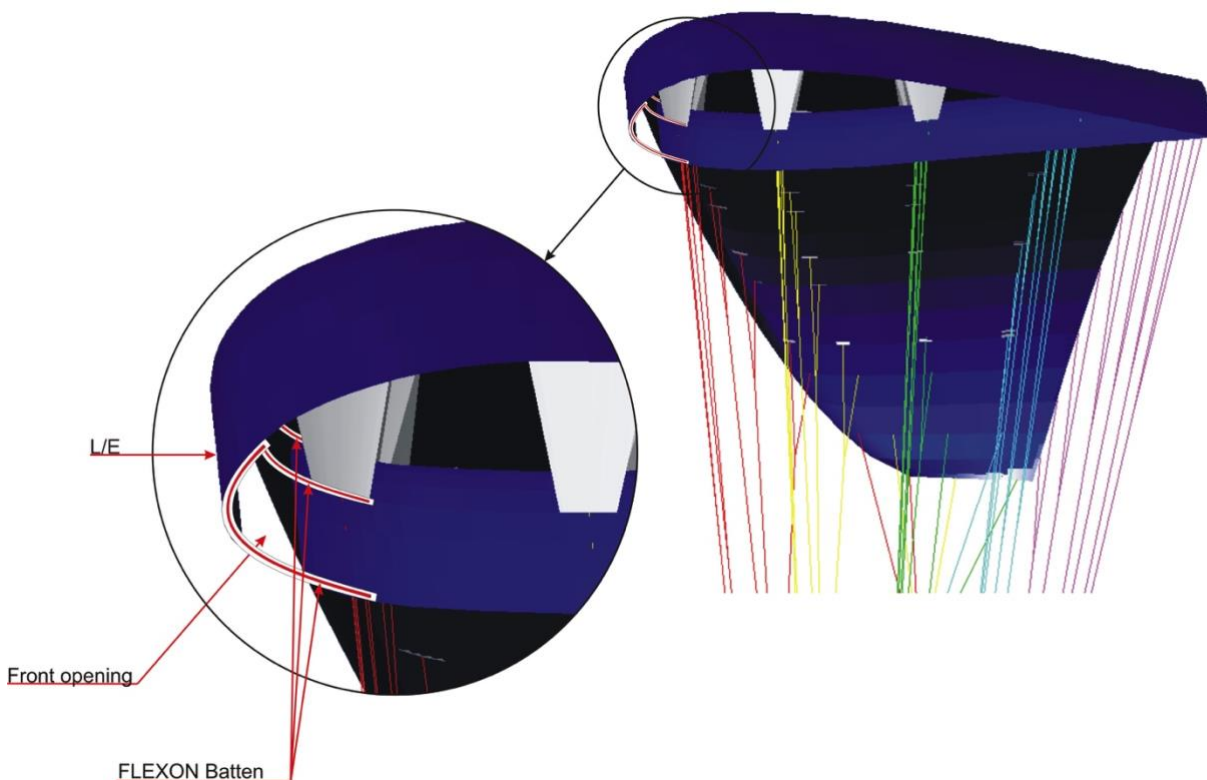


## **FLEXON® Batten system:**

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:**



## **8 APP- Automatic Pressurising Profile**

The wing uses a new generation of aerodynamic profile (**APP**) which has the intake located further back on the bottom surface of the wing, and not at the front stagnation point.

The intake directed primarily against the direction of flow on the bottom surface of the wing.

This technology results in an increase in internal pressure as the flow velocity is increased, regardless of the position of the front stagnation point.

Meaning that as the angle of attack decreases the flow velocity is increased as well as internal pressure of the wing (Contrary to the "classic" profile).

All of the above is reflected in a wing which is exceptionally stable when accelerated.



## 9 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.

## 10 HARNESS

All of Apco's gliders are developed with the use of ABS` (Automatic Bracing System) type harnesses without cross bracing. We recommend the use of an ABS harness with all our gliders. All certified harnesses can be used with our gliders. For best safety and performance we recommend an Apco harness equipped with a Mayday emergency parachute.

### **CAUTION:**

#### **WE RECOMMEND NOT TO USE CROSS BRACING STRAPS.**

APCO GLIDERS ARE DEVELOPED AND TESTED WITHOUT THE USE OF CROSS BRACING. USING AN ABS HARNESS WITH CHEST STRAP SET AT THE SPECIFIED WIDTH (CHECK THE CERTIFICATION STICKER ON YOUR GLIDER) WILL RESULT IN THE HIGHEST PASSIVE SAFETY ON YOUR GLIDER.

## 11 SPEED SYSTEM

### **Assembly & Adjustment**

The Hybrid is equipped with a speed system, but no trimmers on the risers, and no other adjustable parts on the risers.

Apco gliders are supplied with a speed system compatible with most harnesses on the market today. Follow your Harness Manual for connecting your speed system. Do a hang test to ensure that the adjustment is correct. Flying with a speed system adjusted too short will cause it to be applied all the time, which can be dangerous.

### **WARNING:**

The use of the speed system in turbulent conditions or close to the ground is dangerous. While flying with the accelerator, the glider has a reduced angle of attack and is therefore more susceptible to turbulence and may collapse or partially deflate. Gliders react faster when accelerated and may turn more. The accelerator should immediately be released in this case.

## 12 EMERGENCY PARACHUTE ATTACHMENT

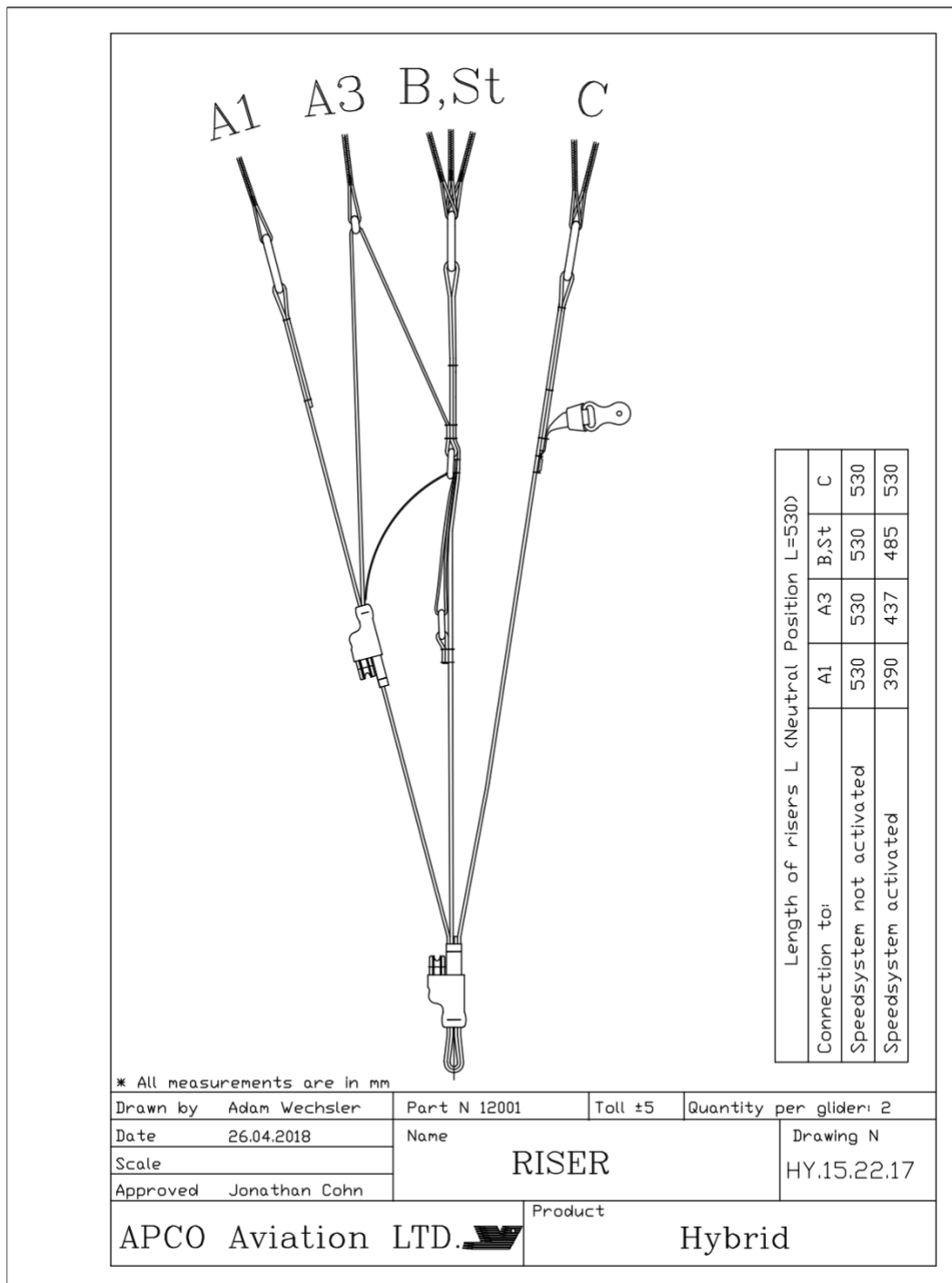
It is recommended to use a certified rescue parachute when flying. Attaching the rescue parachute should be done in accordance with the recommendation of the harness and reserve parachute manufacturer.

## 13 RISERS

Perfect 12 [mm] webbing risers with incredible attention to detail. They are lightweight at less than 99 gr! Incorporating a unique A3 (Split A) line connection method with no karabiners! Making it cleaner, safer, lighter - smart and elegant.

Specifically designed ball bearing pulleys allow for the smoothest speed system operation possible.

At no time should the pilot change the risers or use risers not intended for this specific glider as this will affect the performance, safety and certification of the glider.

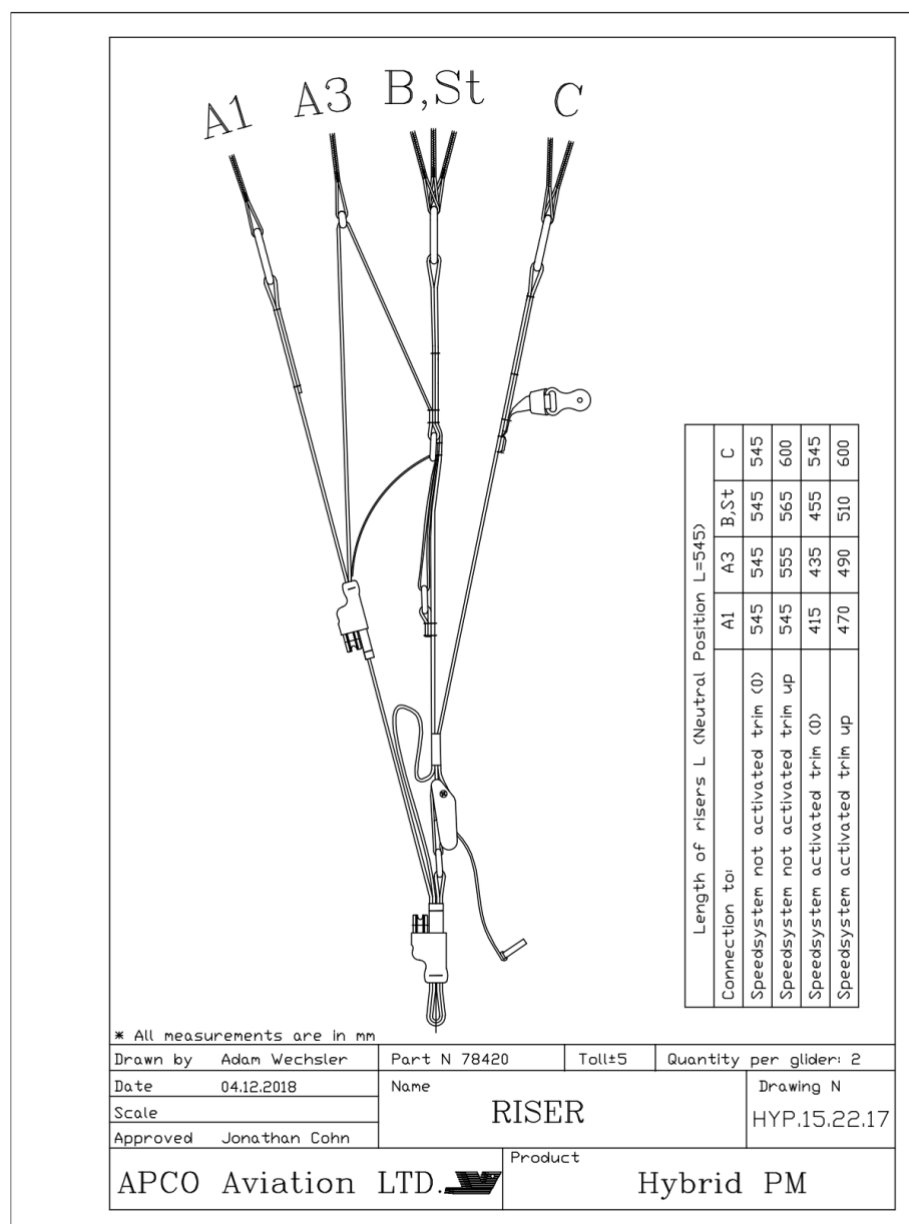


## 14 PARAMOTOR RISERS

The Hybrid Paramotor riser differs from the above standard riser in having a trim system and Aluminium V-Links between the risers and lines. The trimmer has a reduction system to make it easier to close, which is important as the trim releases both the B and C legs of the risers to keep a clean profile. Without the reduction, it would be harder to apply / close the trimmers.

The Neutral position is fully closed, and this position should be used for take-off and landing. The trimmers can be opened when additional speed is required on long distances. It is possible to use the speed bar combined with the trims open, but we recommend keeping the trimmers closed when flying actively on the speed system and at higher speeds.

Using the trimmers will void the EN-B Certification (Free Flight), but the DGAC certificate includes the use of the trim risers.



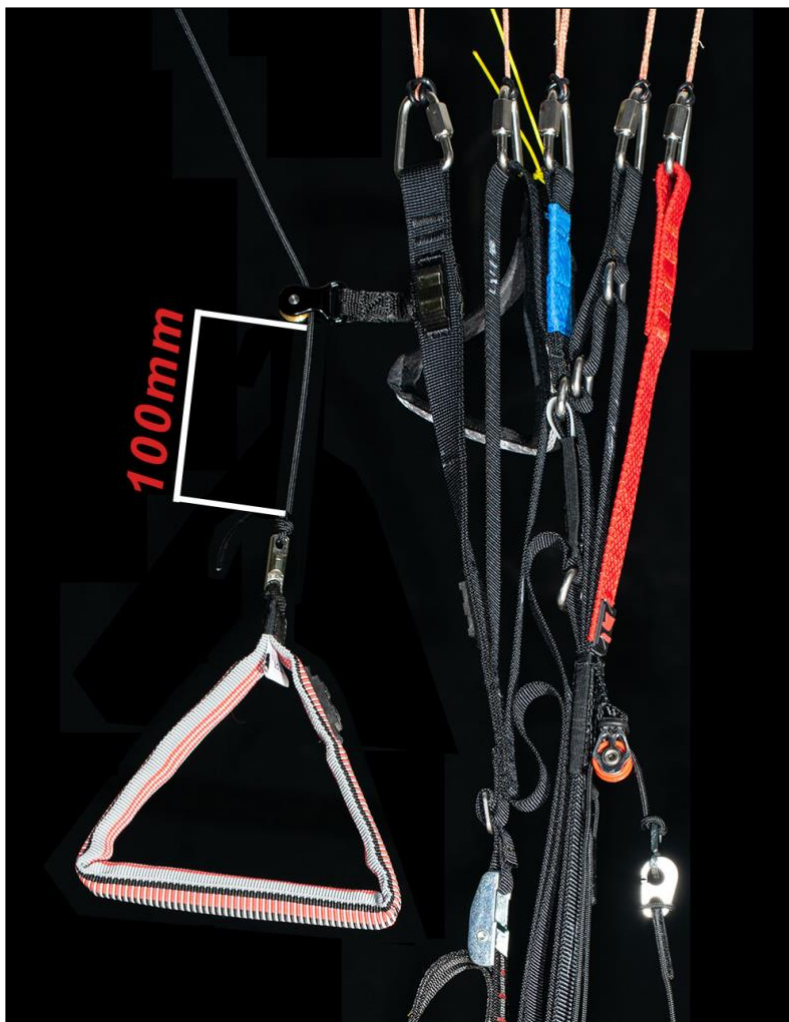
## 15 INSPECTION

### General

**Pilots, please ensure that your glider 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.**

### Brake Setting



Before the first flight the pilot / dealer has to inflate the glider in the flight configuration, on the intended harness, to check and if needed, adjust the brake line length as required. It is important that the brakes are not set too short. If the glider is above your head the brakes should have about 10 cm of free travel in the brake from the brake guide on the riser to the activation point of the brakes (See Diagram). If the pilot changes the harness, or especially in paramotor use, the frame, hook-upheight / type, please check the brakes again to ensure that the brakes are not too short.

Since there are several hook-up point configurations on paramotors, the Hybrid P/M comes with longer brake lines to allow for adjustment to your requirements, however, this

should only involve lengthening not shortening. Shortening the brakes will cause them to be too short when accelerating the wing, which can be both dangerous, and inefficient. The excess line should be trimmed or taped or stowed in a safe manner so that they do not increase the chance of the brakes getting pulled through the mesh into the propeller.

### First Check and Pre-Flight Inspection

With every new glider, the following points should be checked:

- Connection points between the glider and the harness.
- Check that there are no lines twisted, tangled or knotted.
- Check that the risers and speed-system are hooked up to the harness correctly.

## Regular Inspection Checks

- Damage to lines, webbing and thread on stitching of the harness and risers.
- Soft-Links are secure and not unduly worn. Replace if worn out.
- The pulleys of the speed system are free to move and the lines are not twisted.
- The condition of the brake lines, swivels and the security of the knot attaching the brake handle to the brake line, check especially the line for wear where it connects to the swivel.
- The sewing and connection of the lines. Check for wear on the inside (contact) surfaces of the lines against the Soft-Links.
- Damage to hook up points on the glider.
- Internal damage to the ribs and diagonal ribs.
- Damage to the top and bottom panels and seams between panels.

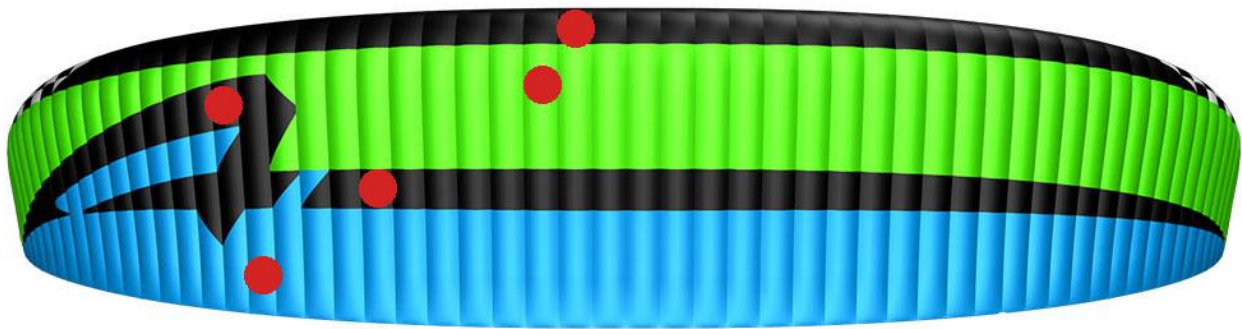
## Annual / Periodical Airworthiness Inspection

It is highly recommended that your glider (and other equipment), undergo a Periodical Airworthiness Inspection which is to be done by Apco, or an Apco approved / appointed service centre.

This is recommended to be done every 24 months or every 100 hours, whichever comes first. 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.

### Porosity:

Porosity is measured with a calibrated porosimeter. It should be measured in at least 5 different places on the upper surface. Below is an example of the sections we test at Apco. The upper surface, at 20-35% chord (from L/E) is most prone to becoming porous, and is thus the most important section to test. It is also important to test the different cloth types, and different colours used.



### Line Maintenance

Superaramide 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 glider. Avoid sharp bending and squeezing of lines. Take care that people do not step on the lines. Do not pull on 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.





One line of each line group (a, b, c, upper and lower) must be tested for minimum 50% 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. Never replace lines with different diameter or type of lines as all gliders were flight and load tested for safety in their original configuration. Changing line diameter/strengths can have dangerous / fatal consequences.

Professional use of gliders: towing, tandem, schooling and competition flying requires more frequent line inspection and replacement of A, B, C, D and brake lines.

[For replacement lines please refer to our online direct line service.](#)

## 16 TAKE OFF

As this is not a training manual we will not try to teach you launching techniques. We will only briefly go through the different launch techniques to help you get the most out of your glider.

### Layout

Pre-flight check should be done before every flight.

Spread the glider on the ground. Spread the lines, dividing them into eight groups A, B, C 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 glider and none are caught on vegetation or rocks under the glider. Lay out the glider 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!

### Alpine Launch / Forward Launch

The HYBRID has very good launch behaviour in no wind conditions.

For the best results we recommend the use of the following techniques: Lay out the glider and position yourself in the centre of the wing with the lines almost tight.

With a positive and constant force inflate the wing holding only the A-risers, and smoothly increase your running speed. The wing will quickly inflate and settle above your head without the tendency to stick behind, you may have to pull some brake to stop the wing from overshooting on an aggressive run.

After you leave the A-risers, apply about 15% brakes and the HYBRID will gently lift you off the ground.

### Strong Wind and Reverse Launch

The HYBRID has a lot of lifting power and care should be taken in strong wind. It is advisable to have an assistant hold you when attempting a strong wind launch. It also helps if you walk towards the canopy and leave the A-riser just before the glider gets above your head. Then pull a bit of brake to stop the wing from overshooting, but not too much as the glider might





pull you off your feet too early. The assistant should let you walk in under the wing on inflation rather than resist the inflation; this reduces the tendency of the glider to lift the pilot prematurely.

## **Tow or Winch Launching**

All APCO gliders are well suited for winching and have no bad tendencies on the winch. With towing it is important to have the wing above your head on launch and not to try and force a stalled wing into the air. This is especially important if the winch operator is using high tension on the winch. Very little brake if any need be applied on launch and during the tow. Directional changes can be made with weight shift rather than brakes. While on tow, the brake pressure will be higher and more force may be needed to make corrections than in normal flight.

For all our gliders we recommend using tow accelerating system. There are different types existing on the market. Please check with your dealer or tow operator for the recommended tow accelerator system. Use of it will eliminate any chance for accidental stalling on tow.

## **17 FLIGHT TECHNIQUES**

The HYBRID is an easy and pleasant glider to fly, it has excellent performance and was designed for cross country flying, but can be enjoyed by a wide range of pilots too.

### **Flying Speed**

Indicated trim speed is dependent on the amount of brake the pilot is using, wing loading, altitude above sea level and the accuracy and make of speed probe. The speeds recorded in technical data were at optimum wing loading at sea level using a Flytec 6030 thus there could be a slight variation in speed range numbers that pilots record.

Speed readings in the flight reports could differ as this was measured during testing using various instruments and is an indication of the difference between trim, stall and top speed. The speed range will be the same but the actual numbers may differ.

- With 0% brake the HYBRID will fly at 35 km/h with a sink rate of 1.1 m/s.
- At 25% brake the glider will fly at 31km/h with minimum sink rate 0.95 m/s.
- The best glide angle is achieved with 0% brakes and 0% speed system.
- With 80% brake the glider will fly at about 23km/h and will be close to the stall point 21km/h.

#### **CAUTION:**

APART FROM WHEN FLARING AT LANDING THERE SHOULD BE NO REASON TO FLY WITH 70% TO 100% BRAKE. THE SINK RATE OF THE GLIDER WILL BE EXCESSIVE AND THERE WILL BE A POSSIBILITY OF ENTERING A DEEP STALL OR FULL STALL SITUATION. THERE IS ALSO THE RISK OF GOING NEGATIVE OR ENTERING A SPIN WHEN ATTEMPTING TO TURN THE GLIDER NEAR THE STALL SPEED.



**WARNING:**

The use of the speed system in turbulent conditions or close to the ground is dangerous. While flying with the accelerator, the glider has a reduced angle of attack and is therefore more susceptible to turbulence and may collapse or partially deflate. Gliders react faster when accelerated and may turn more. The accelerator should immediately be released in this case.

## **17.1 THERMAL FLYING**

The HYBRID has excellent thermalling capacity and will be a pleasure even when you are in a big gaggle or just having fun on a long XC flight.

The glider has highly stable and needs very little pilot input even in very turbulent conditions. In light lift it is advised to make flat turns to keep the glider from banking too much and avoid increasing the sink rate.

In strong lift conditions it is most effective to make small turns in the core with relatively high bank.

For the best climb rate in ridge lift we recommend using about 20% to 25% brake.

## **17.2 ASYMMETRIC COLLAPSE**

If one side of the glider 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 pull 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 pull too much as you could stall the flying side.

The glider is very solid and has a strong tendency to re-inflate after collapse.

## **17.3 CRAVAT**

In case a cravat should occur from an asymmetric collapse or other manoeuvres, it is important to keep your flying direction by applying some brake on the opposite side and then it can usually be opened by pulling down on the stabilo line of the affected side while countering the turn with the opposite brake and weight shift.

It also helps sometimes to pull Big Ears to release the tension on the affected lines, or a combination of the above techniques, i.e. pulling on the stabilo after pulling Big Ears.

## **17.4 FRONT STALL OR SYMMETRIC COLLAPSE**

In the event of a front stall the glider 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.

## **17.5 B-STALL**

The HYBRID has a very clean, stable B stall.

To enter the B stall the pilot has to pull the first 20-cm slowly until the glider loses forward speed and starts to descend vertically.

Then the pilot can pull more on the B until he/she attains a stable 7 to 9 m/s descent rate. The Glider has no tendency to front rosette or become pitch unstable. To exit the B stall the



pilot releases the B slowly until the glider has regained its shape and then the **last 15 cm fast** to prevent the glider from entering deep stall.

The HYBRID can be controlled directionally in the B stall by pulling more on one B riser than on the other to create a turn in any direction. The B-stall is a safe controlled way of losing altitude fast without any forward speed.

## **17.6 BIG EARS**

Altitude can be lost in a controlled way by collapsing both tips. To do this, take the outermost A-line (attached on its own riser) on both sides and pull them down until the tips collapse. Pulling one side at a time may be more comfortable and easier, especially for smaller pilots. This should close about 40% of the wing in total. It is possible to steer with weight shift.

To increase the sink rate the pilot can push the speed system after he/she has collapsed the tips. This can give up to about 7 m/s sink-rate with about 38-km/h forward speed. To exit, release the speed system and then release the tip A-lines.

It may sometimes be necessary to apply a little brake to open the tips. If using the brakes to open the tips, it is best to open one tip at a time, this avoids reducing your air-speed.

### **CAUTION:**

DO NOT ATTEMPT ANY EXTREME MANOEUVRES WITH THE TIPS COLLAPSED AS THIS DOUBLES THE LOAD ON THE CENTER LINES AND ATTACHMENT POINTS, WHICH COULD LEAD TO LINE FAILURE.

## **17.7 DEEP STALL OR PARACHUTAL STALL**

Under normal flying conditions the HYBRID will have no tendency to enter deep stall. All gliders can however under certain conditions enter and stay in deep stall configuration (as a result of ageing of materials, improper maintenance or pilot induced).

### **17.7.1 Signs of parachutal stall**

- The pilot has very little or no forward speed and no wind in his face.
- The glider might have a very slow turning sensation.
- You will have an increased sink rate.

### **17.7.2 Exit from parachutal stall**

It is important to recognize this situation. Most accidents involving parachutal stall happen because the pilot did not realize that he was in deep stall.

The best way to exit a parachutal stall is to pull all the A risers down to get the wing flying again. The pilot can pull the riser down until the wing starts to fly again. The moment the wing starts to fly the pilot should release the A risers, or the wing might suffer a frontal collapse.

Alternatively the pilot can push the speed bar to lower the angle of attack and get the wing flying again.



By pulling one or both brakes while in deep stall the pilot can accidentally enter a full stall or spin. (Not recommended)

## **17.8 SPIRAL DIVES**

The HYBRID has very good behaviour in spiral and has no tendency to stick in the spiral. By progressively applying brake on one side the glider 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 glider 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 GLIDERS CAN BE NEUTRAL IN SPIRAL AND MAY NOT EXIT WITHOUT PILOT INPUT. TO EXIT A NEUTRAL SPIRAL THE PILOT HAS TO LEAN HIS/HER WEIGHT TO THE OUTSIDE OF THE TURN OR APPLY BRAKE ON THE OUTSIDE WING. AS SOON AS THE GLIDER 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).

## **17.9 STRONG TURBULENCE**

**NEVER FLY IN STRONG TURBULENCE!**

If you unexpectedly encounter strong turbulence, fly with about 20% brake applied to increase the angle of attack of the canopy and land as soon as possible. If the air is turbulent on landing approach, land with Big Ears.

Learn to fly actively and to anticipate collapses and prevent them by applying brake when needed before you have unwanted collapses.

## **17.10 STEERING NOT FUNCTIONING**

If the pilot cannot reach the brake or steering lines for any reason or if they are not functioning properly, (for example: If they break on a damaged point) the pilot can control the glider by pulling down on the rear risers.

Care must be taken when steering like this, as much less input is needed to turn the wing and the response of the wing is also much slower than when using the brakes.

**WARNING: IF YOU PULL TOO MUCH ON ONE OR BOTH REAR RISERS THE GLIDER WILL SPIN OR STALL.**

On the landing flare the pilot should be especially careful not to stall the glider too high.



## 18 LANDING

Before landing, the pilot should determine the wind direction, usually by checking a windsock, flags, smoke or your drift over the ground while doing one or more 360° turns.

- Always land into the wind.
- At a height of about 50 meters your landing setup should begin. The most commonly used one is to head into the wind and depending on the wind strength the pilot should reach his/her landing point by making s-turns.
- At a height of about 15 meters the final part of your descent should be made at trim speed into the wind.
- At a height between half a meter and one meter you can gently flare the glider by pulling gradually down on the brakes to the stall point. When top-landing it is sometimes not necessary to flare or a much smaller flare may be required, especially in strong ridge conditions.

### 18.1 TREE LANDING

If it is not possible to land in an open area, steer into the wind towards an unobstructed tree and do a normal landing approach as if the tree is your landing spot. Flare as for a normal landing. On impact hold your legs together and protect your face with your arms.

After any tree landing it is very important to check all the lines, line measurements, and the canopy for damage.

### 18.2 WATER LANDING

As you approach landing, release all the buckles (and cross-bracing if present) of the harness except for one leg. Just before landing, release the remaining buckle. It is advisable to enter the water downwind. Let the canopy rotate completely forward until it hits the water with the leading edge openings; the air inside will then be trapped, forming a big air mattress and giving the pilot more time to escape. Less water will enter the canopy this way, making the recovery much easier. **Get away from the glider and lines as soon as possible**, to avoid entanglement. Remember that a ballast bag can be emptied and then inflated with air for a flotation aid.

The canopy should be carefully inspected after a water landing, since it is very easy to cause internal damage to the ribs if the canopy is lifted while containing water. Always lift the canopy by the trailing edge, not by the lines or top or bottom surface fabric.

### 18.3 LANDING IN TURBULENCE

One of the safest ways to land a glider in turbulent conditions is to use Big Ears. This reduces the chances of getting a collapse while on final approach. Use weight shift to control your approach. It is possible to keep the ears in until you are ready to flare the glider. Simply release the A-risers and flare the glider, starting a little higher than usual. Practice this in normal conditions before you need it in an emergency.

## 19 PACKING

Spread the canopy completely out on the ground. Separate the lines to the left and the right side of the glider. If the risers are removed from the harness, join the two risers together by



passing one carabineer loop through the other. This keeps them neatly together and helps to stop line tangles.

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. Place the risers at the trailing edge of the folded canopy and use them to finally roll up the canopy.

## 20 MAINTENANCE & CLEANING

Cleaning should be carried out with water and if necessary, gentle soap. If the glider 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.

## 21 STORAGE

When the glider is not in use, the glider should be stored in a cool, dry place. A wet glider should first be dried (out of direct sunlight). Protect the glider against sunlight (UV radiation). When on the hill keep the glider covered or in the bag. Never store or transport the glider 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 60°C

At these temperatures Nylon permanently changes its characteristics which may alter the behaviour and shape of the wing.

It will cause permanent damage to the paraglider, rendering it non-airworthy. APCO's warranty will not be applicable.

## 22 DAMAGE

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

## 23 GENERAL ADVICE

A qualified person or agent of the company should check the glider every year.

The glider is carefully manufactured and checked by the factory. Never make changes to the canopy or the lines. Changes can introduce dangerous flying characteristics and will not improve flying performance.

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

Paragliding and Paramotor flying should always be done in a way that has minimum impact on wildlife and the environment. Respect access regulations and the wishes and rights of landowners. Do not litter or start fires, do not smoke near your or other peoples wing and equipment. Do not launch, fly or land in a manner that harasses, disturbs or endangers people, wildlife or property. To summarise - don't be a jerk!

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

**If you have any questions regarding Apco Products, please contact your dealer or Apco.**



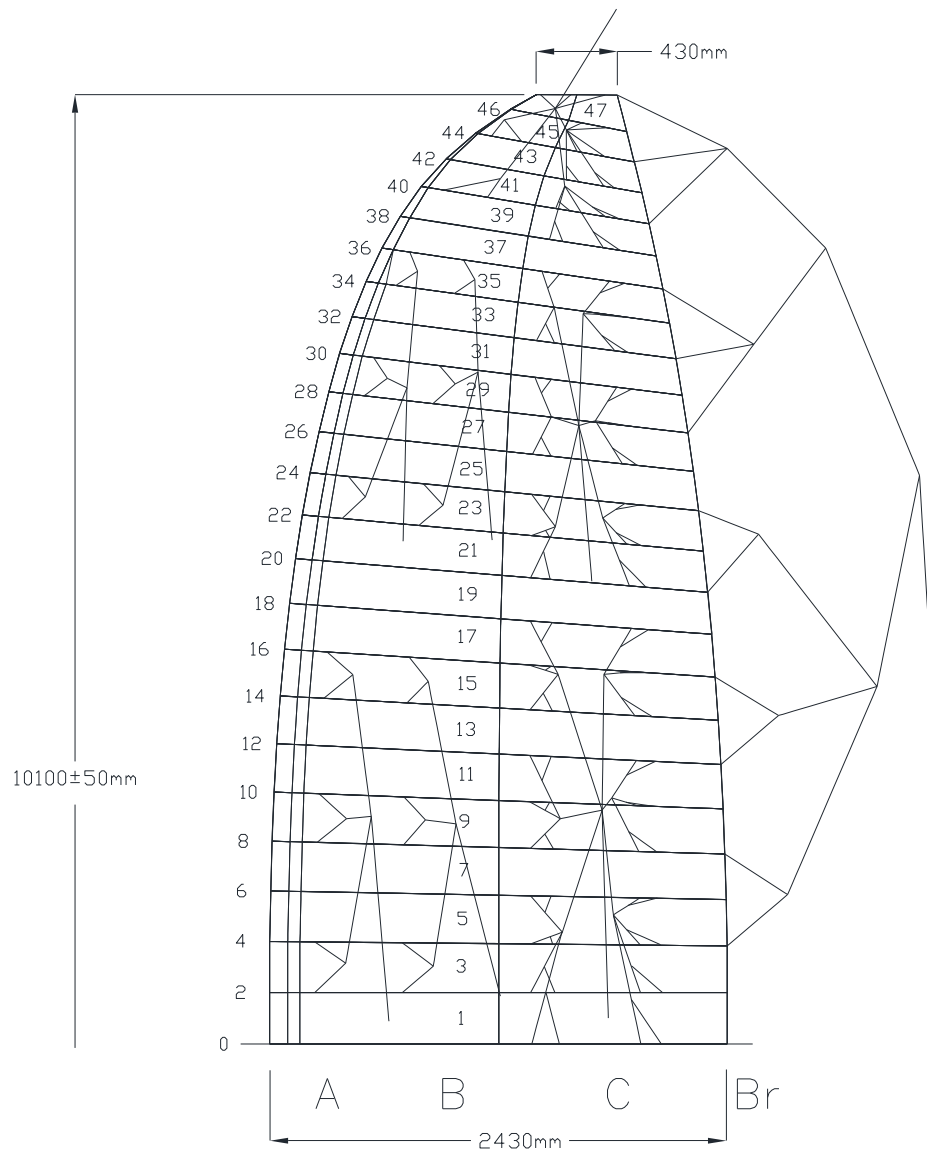
**Lastly, be equipped with a certified emergency parachute and helmet on every flight.**

## **24 RECYCLING**

If you need to dispose the wing, do so in an environmentally responsible manner. Recycling of many parts of the wing is possible, and there are some organizations that manufacture reusable shopping bags, windsocks, backpacks and more using old donated wings. Funds raised are often used for charitable donations. Search the web, or contact The Cloudbase Foundation for more information or advice. Do not dispose of a retired wing with normal household waste.

## **25 HYBRID SMALL SKETCHES**

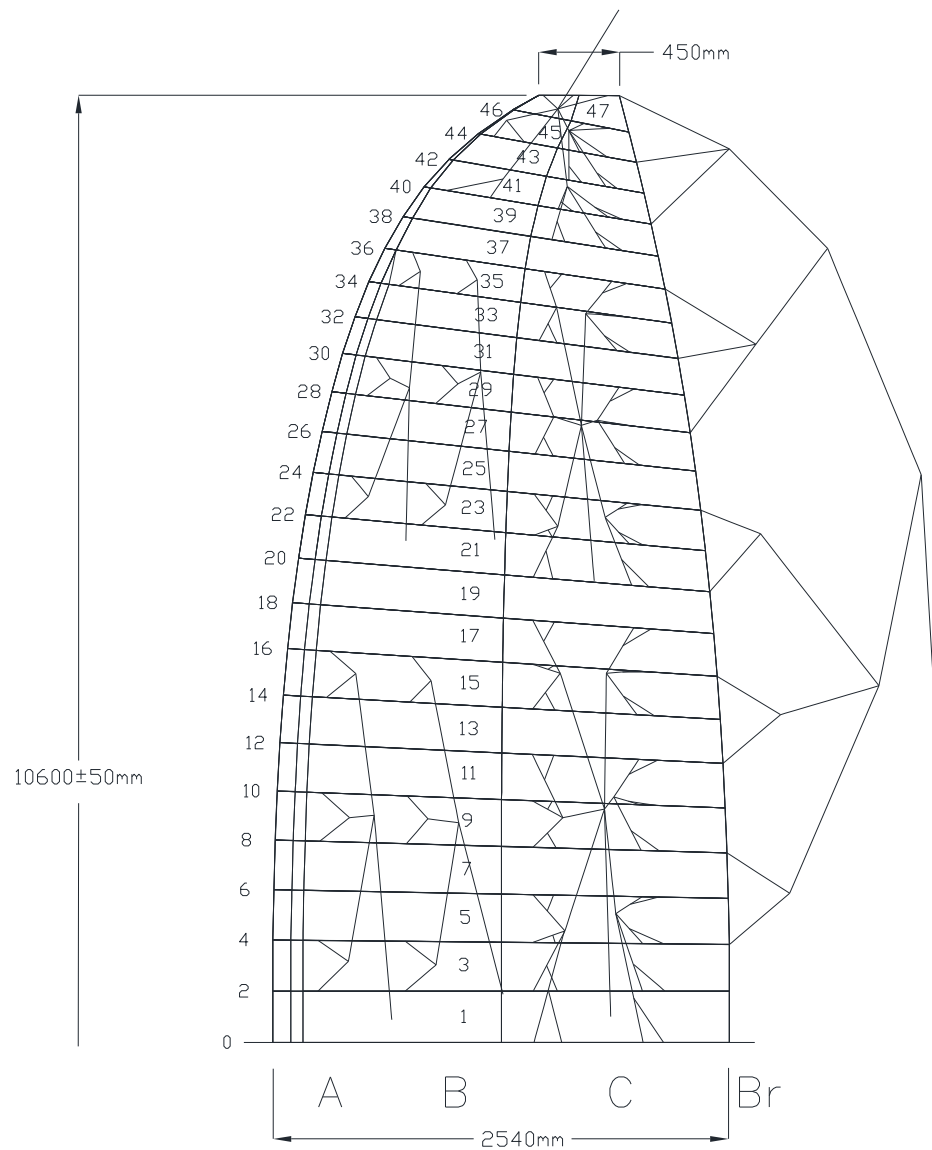




\* All measurements are in mm

Drawn by Adam Wechsler	Part N	Toll ±10	
Date 26.04.18	Name	Drawing N	
Scale	Lines sketch		HY.15.10.38
Approved Jonathan Cohn	Product		Revision
APCO Aviation LTD. 	Hybrid <S>		0

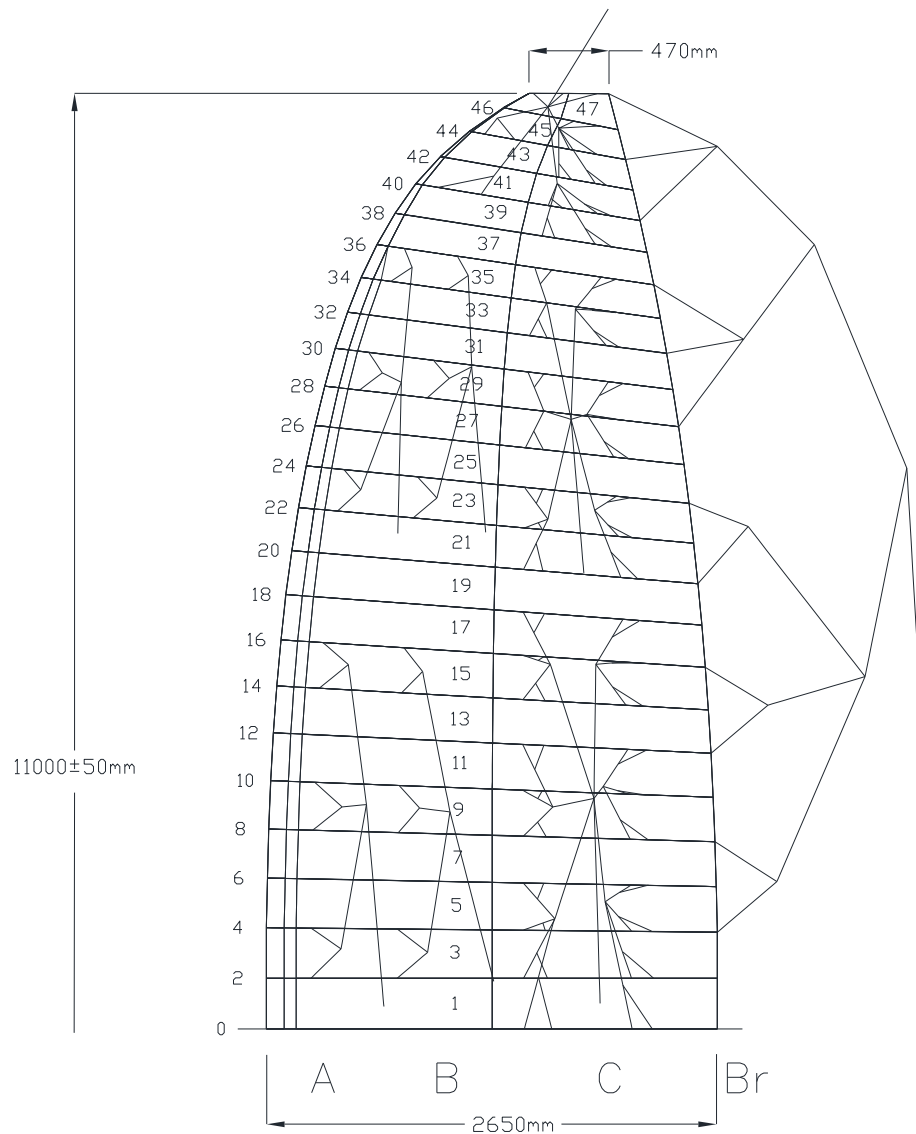
## 26 HYBRID MEDIUM SKETCHES



\* All measurements are in mm

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Approved Jonathan Cohn			
APCO Aviation LTD. 		Product Hybrid <M>	Revision
			0

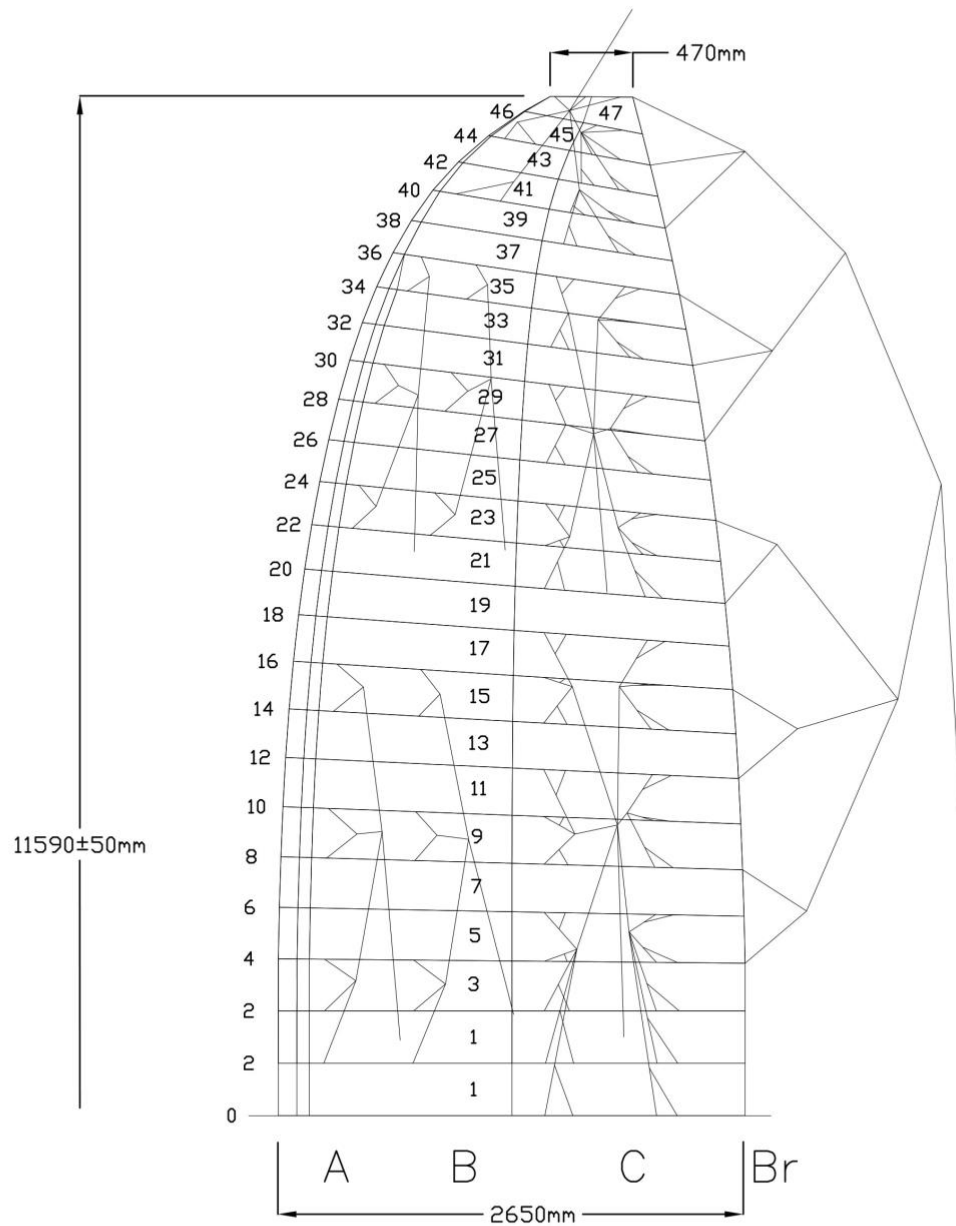
## 27 HYBRID LARGE SKETCHES




\* All measurements are in mm

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Approved Jonathan Cohn	Product		Revision
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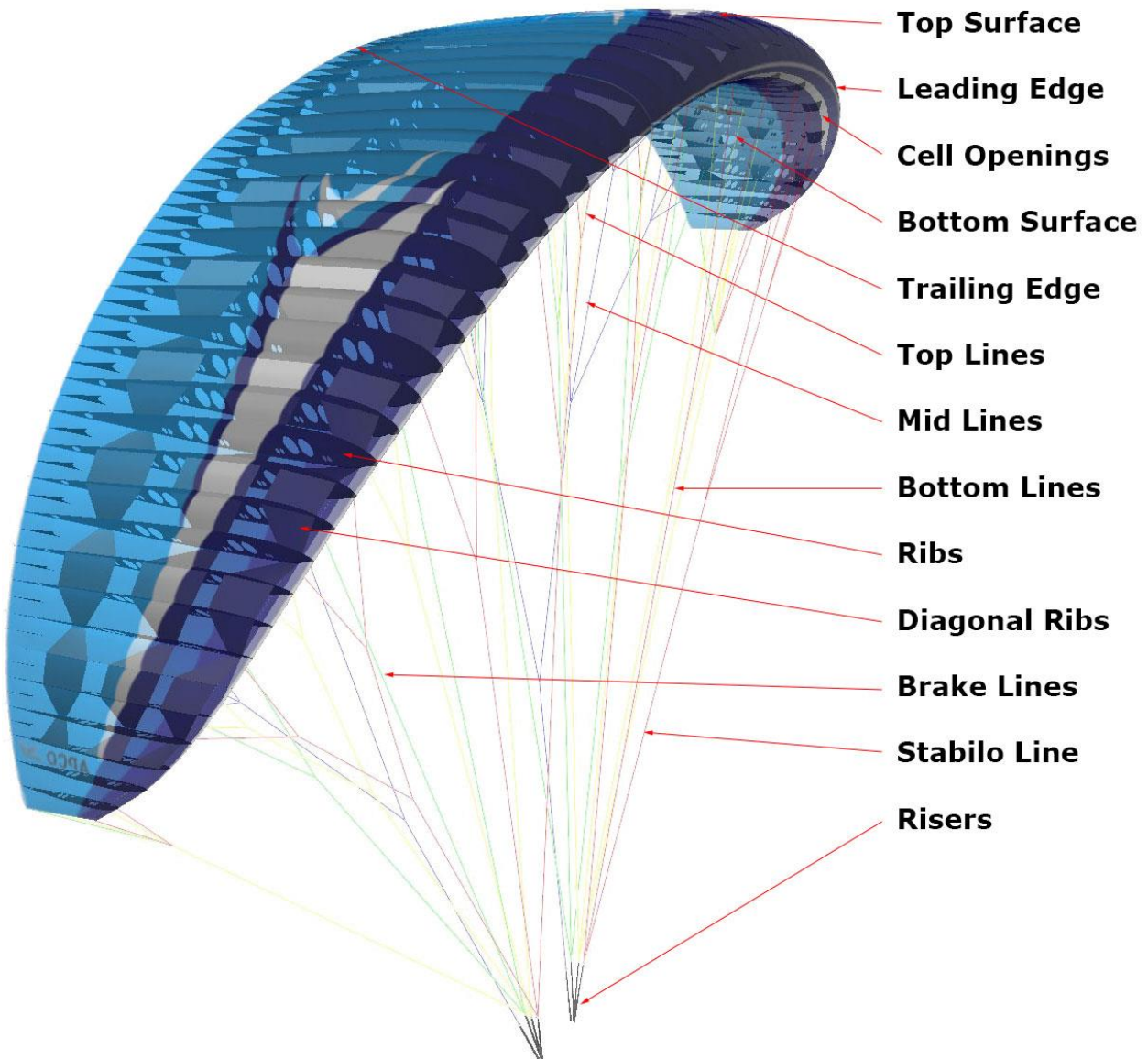
## 28 HYBRID X-LARGE SKETCHES



\* All measurements are in mm

Drawn by Adam Wechsler	Part N	Toll ±10	
Date 26.10.19	Name	Drawing N	
Scale	Lines sketch	HY.15.10.38	
Approved Jonathan Cohn	Product	Revision	
APCO Aviation LTD. 	Hybrid <XL>	0	

## 29 Parts of a Paraglider







APCO wishes you many hours of enjoyable flying.  
Take Air!