



Photo: Bill Morris

Bill Morris gets to grips with the Hybrid in free flight (with paramotor-type trimmers closed to retain EN B certification)

## flight test: **Apco Hybrid** BILL MORRIS AND PAUL MAHONY REPORT

For decades the perpetual question in paraglider design has been whether or not the art has reached a pinnacle, leaving nowhere else for innovation or performance to go. Yet, despite naysayers proposing that there is nothing original left to achieve, there are still surprises ...

One of the biggest of current times has to be the Apco Hybrid, combining, in simple terms, a double-surface wing at the leading edge with a single surface at the back. An interesting point is that hang gliding, in which Apco has taken an eminent part, began with single surfaces and gradually progressed towards double; today such wings can still be a combination of both.

Decades later this aspect of paraglider design is going in the opposite direction, exploring just how a combination of the two elements can produce results; it is an original and bold step. There should, by the way, be no confusion with the term 'hybrid' as often bandied about to describe double-surface wings that can be used for several types of flying – less a design advance and more a mix of wishful thinking and hype.

Apco say the Hybrid offers the best of both worlds, its accessibility and ease of flying inviting hike-and-fly, regular flying and paramotoring too (see below). Early reviews

have cited better pitch behaviour than other single-surface wings, and good roll stability conferred by the exposed ribs.

Apco appear to have thrown all their whistles and bells at the Hybrid to make it go well. The intakes have the benefits of shark-nose opening stiffeners, with seemingly-indestructible Flexon battens that extend into the single surface. And there are Apco's signature flow-aligned ribs, an attempt to adjust the cell orientation to reflect where the air actually wants to flow.

In terms of material, by using Skytex 27 and 33 the Hybrid is a light wing at 3.2kg, but not an out-and-out lightweight – the fabric weight is common to many 'normal' gliders. Soft links, without rope risers, are a nod to weight saving, but colour-coded line sets are of more practical benefit.

If I can describe the aerodynamics clearly enough, the front double surface is intended to keep a solid nose profile,

undisturbed by braking pressures, while directing more air over the rear single surface at higher speed, hence better pressure.

I flew the Large model at the top end of its 85 - 105kg all-up range. This was easily managed, but an XL size above this should be possible. The Hybrid can be built in the larger sizes as it is demonstrably faster than a pure single-surface wing; to achieve the same sort of speeds a comparable single-surface glider would have to be in the 18m range.

The traditional wing review always starts with the launch, and it is common on recreational wings to say that they launch easily and can be very passive overhead. The Hybrid launch is nearer the single-surface experience, coming up easily but stopping without overshooting, even in strong winds; in light or no wind it is extremely easy. In higher winds it obviously comes up more rapidly, but once

up it is the most unmoving and self-leveling wing I have flown in any class. As ground handling fanatics know, there is a lot to be learnt at this phase of flight. For the Hybrid it means good, passive flying, easy starts and light turns.

The Hybrid is a very, very firm wing – a term I would normally use to describe a good response to active flying. Pitch and roll are very contained and the usual brake-down-and-up ride is quickly damped out. I use a knee-cam to get a good look at wings in flight and I doubt if I have ever seen a wing so still; were it not for the slight ruffling of some of the single-surface flares you'd be hard put to believe the video was not a still.

The brakes are light, and generating large amounts of roll (e.g. wingovers) is more controlled because of this. The general passivity of the wing makes steep turns and wingovers hard to do, and with less feedback through the brakes timing is more critical. The reason for the brake lightness is that, like all the single-surface gliders I have flown, there is no internal pressure and no double surface to squeeze like an empty toothpaste tube.



Photo: Paul Mahony

Paramotor riser setup - note trimmer and neat V-link connectors

Again like a complete single-surface wing, the brakes are far more rigging lines than just free-floating deflection lines. You can feel what the wing is doing – which, most of the time in a straight line, is nothing at all. The overall effect is to feel that you are on any other wing; it's reassuring to confirm that the Hybrid's novelty of design is not reflected in a strange ride.

I liked the feel very much, once used to it, and it certainly it takes a lot of fatigue out of the arms for longer airtime. Also there is not the urge to try and keep the wing in the air by holding hard brake against the pressure. Turns and centring lift are best flown by exploiting the good sink rate at flat-out speed, learning to trust that there will be little pitching out, but also that you have to work at it and not be lazy.

As expected, the speed bar is light and it works, but in small increments. The glider's size, and the front surfaces, make the Hybrid very easy to land and flare and no abnormal technique is needed. Although rated B in the tests, the feel is of a good A wing, capable of taking much

abuse without drama; early-career pilots will certainly be capable of enjoying such performance.

In the end, the obvious question: is it the best of both worlds, the sum of its parts, or neither one thing or the other? The Hybrid flies well and has some real plus points, and its ease of handling and positive stability will entice many pilots. It is a very calm and pleasant wing to punt around on and it takes a lot to get it to misbehave. My view is that it is a combination of the two types, both in pluses and minuses, as it would have to be.

It's not as light as some and it's not small to pack (lots of battens), but is a so-far unique innovation containing a lot of good thinking and execution. For my money it's the most original design in years and could lead to some changes in paraglider evolution, especially in regard to trailing-edge design.

Future versions of the Hybrid – I am sure there will be more – will have to figure out the balance. But make no mistake, the Hybrid has arrived as a design that shows no obvious compromises; it is at least the sum of its parts. I feel slightly churlish in describing such a wing, with all its innovation, in somewhat ordinary terms. But this surely is more of a compliment; much paraglider innovation has led to far less pilot enjoyment and the requirement to balance high skills against risk ... not always a good idea.

Apco report that they believe that the Hybrid-type design is the way forward for the future and that the number of varieties will increase. That remains to be seen, but what cannot be denied is that they have gone for this departure in a big way, to their immense credit. Their innovation, and commitment to it, should command great respect. I agree with them; I think the advent of the Hybrid marks an historic moment. Could it be the shape of things to come?

Free flight report by Bill Morris

## Paramotor Hybrid

I was asked to fly the Hybrid with a paramotor to see what it would be like under power. Having free-flown three different single-surface wings I was looking forward to trying this innovative design; would there be any tangible improvements over a single-surface or conventional double-surface wing? Not many pilots are flying single-surface wings under power, but that isn't saying it can't be done.

My friend Paul Bailey had just finished testing a new carburettor on the twin cylinder Hornet two-stroke with the new Super Light carbon-fibre/alloy chassis. Paul asked me to test the wing with the Hornet while he took some aerial shots from his V5S four-stroke/ Ozone Viper outfit.

Detail on the rucksack, stitching, line material, etc, is covered on the Apco website and I won't repeat it here. There's an option for high or low brake position (of which more below) and the brake line is marked with the recommended factory setting for

# FLYMASTER

## LIVE Tracking Instruments

**NEW** SD series



**LIVE SD for maximum performance & safety**

The ultimate Flymaster flight instrument specially built for competition and XC pilots. Includes LIVETRACKING and RACE competition functions.

LIVE SD

**GPS SD+ for Easy Navigation and Safety**

The ultimate flight instrument sharing the same hardware as the LIVE SD but limited to non RACE competition functions. Specially built for XC pilots. Includes LIVETRACKING.



GPS SD+

**NEW** tracker



Second by second live tracking  
S.O.S button  
IPX7 certified  
Huge battery life  
G-force, RF and pressure sensor  
Worldwide coverage  
Rugged construction  
Magnetic connector

The Industry Standard as used in PWCs, the X-Alps and all major paragliding competitions.



# UK AIRSPORTS

Blencathra Business Centre, Threlkeld  
Keswick, Cumbria. CA12 4TR

01768 779800

info@ukairsports.com - www.ukairsports.com



Happy under power ...

Photo: Apco

## Specification

Model	S	M	L
No. of cells	48	48	48
Span (projected, m)	7.9	8.3	8.6
Area (flat, m <sup>2</sup> )	20	22	24
Aspect ratio	5.1:1	5.1:1	5.1:1
Max. chord (m)	2.43	2.54	2.65
Glider weight (kg)	3.0	3.1	3.2
Certificated weight range (kg)	55 - 75	70 - 90	85 - 105
Paramotor weight range (kg)	70 - 95	85 - 110	100 - 125
EN Certification	B	B	B
DGAC certification	Pending	Pending	Pending
Guarantee	1 year/100 hours materials and workmanship		
Price	£2,650	£2,750	£2,850

**UK distribution:** Available through several outlets; for details go to [www.apcoaviation.com](http://www.apcoaviation.com).

each. The manual states that the pilot can adjust brake length to his preference, but as a BHPA instructor I would not recommend pilots to adjust this.

First, I thought I'd do a bit of ground handling – what a revelation! I tried a reverse launch in only about 2 - 3mph of wind and the Hybrid came up easily. Whether I pulled the As hard or softly, the wing just flew up and remained centrally overhead without any signs of overshooting. I tried some really cack-handed launches without building a wall, with the wing off to one side of the wind and using uneven pulls on the As, but it still came up as if on rails, centralising over my head.

Another plus, in nil or light wind, is that if the wing comes down and the leading edge curls over and closes the cell openings, a simple tug on the As inflates it without any drama. As an instructor I would recommend this wing highly as perfect for teaching the fundamentals. Once technique and muscle memory have been ingrained, handling conventional wings will be a doddle.

There are two positions for the magnetic brake handles and the Hybrid came with them fitted to the higher position. On a mid-hang point machine like the Bailey I would have preferred them on the lower position for flying comfort, but I left them on the higher setting as I wondered if I might need the extra brake travel for landing. Although the Hybrid is not a reflex wing the rear riser is fitted with trimmers for changing the angle of attack, and I set these on slow for ground handling, take-off and landing. There is no recommendation for trimmer settings in the manual but their travel is quite small compared to some of the newer reflex wings. For my first flight I left the speedbar off.

I flew the large size, fitted with trimmers and with Apco's ingenious lightweight aluminum V-links instead of the soft links of the paragliding version. The wing's EN B rating is invalid when the trimmers are opened, but when closed the configuration is identical to the free-flight version. I weigh 88kg suited, booted and equipped with an emergency parachute. The Hornet weighs 30kg with fuel, and with

the wing at 3.4kg we were at the top end of the 100 - 125kg weight range for power.

I laid the wing out for a forward launch, strapped in, took half a step back, completed my checks and jogged forward, with very little pressure required on the As. I could feel the wing flying up to its default position, looked up to check all was good, applied some power, and within five steps committed aviation. Notice I said 'some' power! Although I advise students to use full power for taking off on school wings and low-powered machines, at full power on the Hornet I might have gone up vertically and looped!

First impressions, on looking up at the wing, were that the single-surface C and D beackets flap about a bit in the breeze but the nose seems solid, pressured and stable. It's hard to say if the Hybrid is efficient under power as I only used about a quarter of the Hornet's throttle range. Without power-hungry reflex, and at the speeds it flies, I suspect it will be very efficient. I tried a little porpoising, on and off the power and brakes to get the wing pitching fore and aft. Suffice to say that it has excellent pitch damping, perfectly suited to the beginner-to-intermediate pilots it is aimed at; you'd have to be extremely aggressive to get it anywhere near going negative.

The roll characteristics were equally well damped. Although the brake pressure was light and the travel didn't seem overly long when initiating quick, highly-banked turns, the wing immediately came back centrally overhead once the inputs had ceased. This wing does not retain energy in roll, although wingovers can be done – with good technique! This could be seen as a positive if learning to do wingovers. The Hybrid refused to be drawn in when I tried initiating Dutch rolls with abrupt on-off power changes and brakes.

In the company of an Ozone Viper and a Speedster the Hybrid's overriding negative was its airspeed. Even with the trimmers set fast the other guys – both, admittedly, on reflex wings – were having to fly with their trimmers in and brakes slightly on to stay level with me. I flew it again extensively on a windier day in more turbulent day conditions, using a

Miniplane Top 80 and with the speedbar fitted and in use, and found it handled the bumpier conditions very well. The manual says the Hybrid will do 45+km/h and I may have achieved that, with trimmers out and full speedbar, but into a headwind I would wish for a higher top speed. In a world where most paramotor pilots are flying reflex wings this might limit its appeal, but the Hybrid certainly felt very comfortable and stable.

Landing is a non-event. Just set the trimmers slow, bleed off a touch of speed a few metres above the ground and perform a full flare for a one-step landing. The flare seemed similar to a normal paragliding wing and I used full brake travel. With the brakes set at the lower position and flying at the upper weight limit, in light or nil wind a wrap may be needed by some pilots.

In summary, I'd say less skill is needed to ground handle the Hybrid because it's so ridiculously easy to launch and kite. It really is a perfect wing for schools to teach the basics. As all paramotorists know, it's all about the ground handling!

The Hybrid would also make an excellent first wing for a paramotor student: although it has trimmers it doesn't have super-complicated risers, tip steering and all the other performance extras of modern reflex wings. It does almost everything they do but in a slower, more docile manner – and with simpler risers. However after our student or new pilot has done 50 hours he or she may be wanting something with a bit more performance.

The Hybrid isn't quite a maid-of-all-work; take-offs are easy and stress free, but its lack of high airspeed would limit its potential for non-local flights. Its strong suit is the ease of use, both when launching and in flight; pilots flying alone in their local area may not need the additional speed of reflex types. But well done to Apco for bringing out something new and different, and pushing the envelope a bit further! For those pilots who have done their research and want this type of wing and the performance it delivers, there are more than enough 'pluses' and tons of enjoyment to be had.

Paramotor report by Paul Mahony