F.A.Q.

WHY A KINGPOST?

1. To hold up the structure under negative loads, of course. That's not the problem, we could have done without it and maintained the strength by means of rigid wing struts or other systems. But these solutions will always be heavier and more expensive.

2. A proven ability to best ensure the stability of the sail in climb or descent the twisting and/or the profile reflex must imperatively be mechanically operated. To do this, we use luff lines that run from the top of the kingpost to the tip of the battens. The advantages of this system are reduced weight, efficiency that increases with speed, and freedom of movement of the sail lobes, thanks to the lateral freedom of the luffline bridle.

Without a kingpost floating rods are commonly used. These are secured to the leading edge with or without support from the lateral battens. The advantage is reduced drag, but efficiency tends to fall as speed rises because of twisting of the structure under increased forces. Another disadvantage is that the left and right straight rods do not depend on one another, as do the luff lines. When entering a turn, if the systems are set vertically and close to the trailing edge for maximum effect, the outside rod curbs movement of the flat part of the sail lobe and maneuverability is reduced, especially at low speeds.

No flight test can show the effectiveness of these "topless" pitch stability systems because their effect is only felt in circumstances outside of the "normal" flight envelope. Only aircraft undergoing specific tests, such as those performed by the DHV in Germany, can be tested for stability at a pitch of up to -15°. That's exactly what we do for all of our models. The only sour note is that the maximum speed of the aircraft tops out around 120km/hour. Higher than that, this stability remains in the realm of hypothesis. Fortunately the curves obtained with luff lines at higher speeds call attention to an instance of reflex in pitch that rises with the speed. We can thus reasonably expect an improvement in the reflex couple at speeds that exceed that of the aircraft.

The pitch stability systems are designed for extreme maneuvers, intentional or not, high turbulence, stalls in flight that can force the wing out of its flight envelope. It's here that their relative effectiveness can make a difference. That's why we currently prefer to use luff lines whose effectiveness rises with speed, and that don't curb handling at low speeds.

3. The report of drag caused by the upper cable system in a wing like the BioniX suggests the possibility of a maximum gain of 8% in total drag at 130km/h, if the kingpost were eliminated in favor of rigid wing struts. This hypothetical gain is certainly consequential, but it's possible to achieve similar results by reducing twisting. This is the case of the BioniX whose washout & billow can be reduced to a minimum at high speeds thanks to the "CORSET" system, without reducing maneuverability at low speeds, as would be the case of a standard wing.

This hypothetical gain is also counterbalanced by the 10-15% extra weight due to the wing struts and floating rods, and the additional cost, estimated at 20%.
It is still true that a topless wing offers the possibility of folding the wing on the trike and a lower height to enter certain hangars.
The first point is an advantage for the encumbering of hangars, but its practical usefulness is relative, especially in the case of a fast wing with its many battens. The system is in fact only attractive if it can be done quickly & easily, even in windy conditions, without excessive exertion nor risk of damaging the equipment. Flexwings by nature take up little space in a hangar because of the flexibility of their sails, allowing for multiple juxtapositions. For long-term outdoor parking, there are simple solutions such as disassembling the upper beam and setting the wing upon the a-frame or lying it flat on the ground, according to circumstances.
As to the reduced height in order to enter certain hangars, the advantage is uncontestable, but how often is this really a problem?
To sum up, our position is simple: it is first of all in order to use a proven stability system concerning which we have no doubts, the luff lines, that we do not at the present time produce a topless wing. And this in as much as the final results (performance, weight, price, practicality) do not seem to us sufficiently in favor of the system.
We have thus chosen to explore other solutions whose benefits seem wider and which allow a complete exploitation of the speed range, the main problem of flexwings. Considerably lowering the power necessary to fly level at speeds upwards of 120km/h is a good thing. We have been able to do so while retaining a kingpost and sufficient surface to allow for short takeoff & landing, even at maximum load; But one must not forget in an aircraft where we still have the pleasure of flying in the open skies, the drag of the trike and the comfort of the occupants remain natural & inevitable limitations on performance at high speeds.
That's why we believe that reducing fuel consumption drastically in daily usage is possible and more important. In order to do this, one must favor peaceful cruising with a comfortable wing at low speeds, and reserve the potential of high speed cruising for cases where speed is really necessary (travel, wind…)
That is the philosophy behind the BioniX and its "CORSET" system.

WHY 15 m^2?

The BioniX is optimized to carry heavy loads of up to 472.5kg, while retaining pleasant and consistent behavior. In order to respect regulations but especially to retain good performance in takeoff and landing with these extreme loads, 15m^2 are necessary. These 15m^2 will allow you to fly with a passenger, equipped with a motor in the Rotax 912 series, with fuel and baggage, without worrying about the length of trips or motor failure.

If, on the other hand, you fly mostly solo, or you prefer a lighter motor such as the 582, then the iXess 13 retains all of its qualities of liveliness, simplicity, price, and its performance hailed in the press.

FOR WHICH TRIKES IS THE BioniX?

The BioniX was designed specifically for the Tanarg, with which it delivers all of its potential. To obtain unchanging performance at whatever load, the lift is concentrated in the central part of the wing, where deformations are less troublesome. The keel is thus longer than some other models and the GTE/TREK trikes cannot be fitted with it.

AND THIS NAME, BioniX?

WordNet:

Bionics

- application of biological principles to the study and design of engineering systems (especially electronic systems).

That’s the spirit of BIONICS. We are in awe of the possibilities of deformations in the wings of a bird. Quite humbly, we have tried to use them as our inspiration.

The uppercase -X attests to its heritage of our high performance wings: SX, XP, iXess…

WHAT’S THE DIFFERENCE BETWEEN OTHER TRIM SYSTEMS AND THE CORSET?

Standard pitch trim systems act only upon cruising speed in neutral position. Therefore, if the wing is optimized for high speeds, it will be difficult in the roll and hard to pull back the control bar at low trimmed speeds. If the wing is optimized for low speeds, it will be too unstable in roll at high speeds, and hard to push the control bar forwards at high trimmed speeds, and offering deplorable efficiency.

With the CORSET, the cruising speed is of course regulated by the control bar, but the form of the sail is equally optimized to offer maximum effectiveness at the speed selected by the pilot, the best handling, the best stability. The control bar is well placed in all of the configurations. The entire speed range is fully exploitable, with the same comfort.

ARE THE TIP FINS INDISPENSABLE?

Yes, because the BioniX is a wing with less sweepback than our other models and whose speed range reaches quite high. In order to maintain perfect stability in yaw at speeds above 100km/h and up to the VNE of 180km/h, the tip fins are necessary. Stability in yaw means, in practice, low negative yaw, precision handling in roll, stability in turbulence.

AND IN CASE OF CORSET FAILURE?

The CORSET has been static tested up to +6G. Nevertheless, in case of failure, safety straps ensure the profile of the center of the wing. The system would simply return to low-speed configuration.

PRESSURE VALVES, WHY?

To preserve the profile at whatever speed and to limit inflation of the under surface of the leading edge at the tips of the wing. These deformations contribute to instability in pitch and in roll at high speeds. Eliminating them allows us to reduce twisting and thus induced drag and to limit the surface of the tip fins. The pressure valves take advantage of the low pressure of the leading edge of the under surface to literally “suck” the air from between the under surface and the over surface. They were invented by the German company Bautek.

WHAT DO THE TURBULATORS DO?

To optimize its behavior under a heavy load, the lift of the BioniX is concentrated in the central part of the sail and displays a convex profile. The turbulators delay the arrival of airflow in order to exploit the high coefficient of lift of the profile by increasing the maximum angle of attack and moreover allow total control of the wing before stall. And drag? It’s negligible, for only the outer edge is turbulated. Airflow in general does not deflect off the profile, as would otherwise be the case in steep climb or descent without the turbulators.