

MARCH 2014

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WORLDWIDE PARAGLIDING AND PARAMOTORING MAGAZINE. FOR FREE.



# STALLS

PARAGLIDER  
PARAMOTOR



Photo: Nivnik

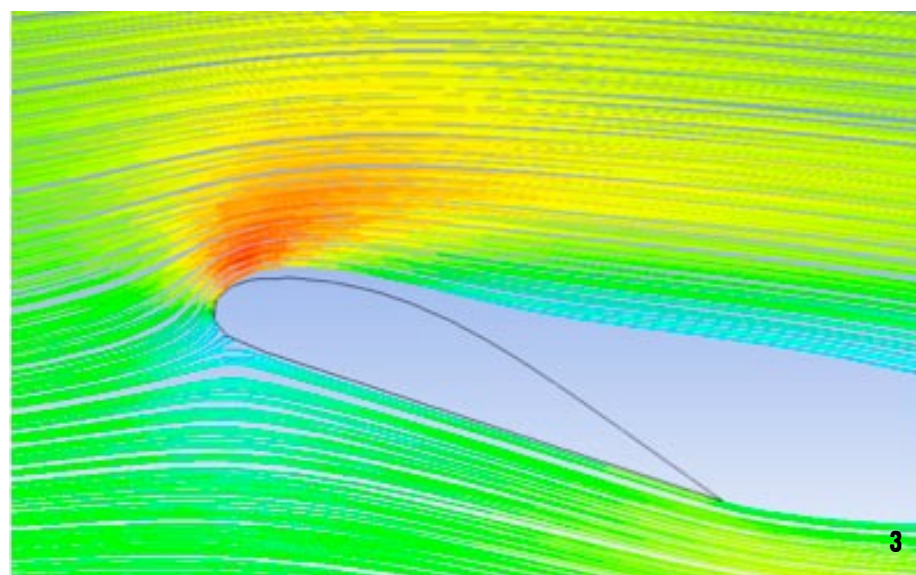
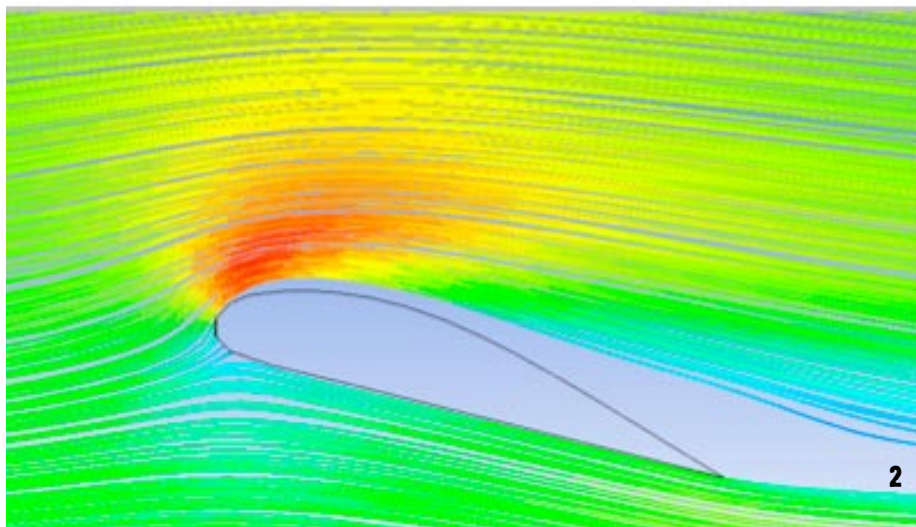
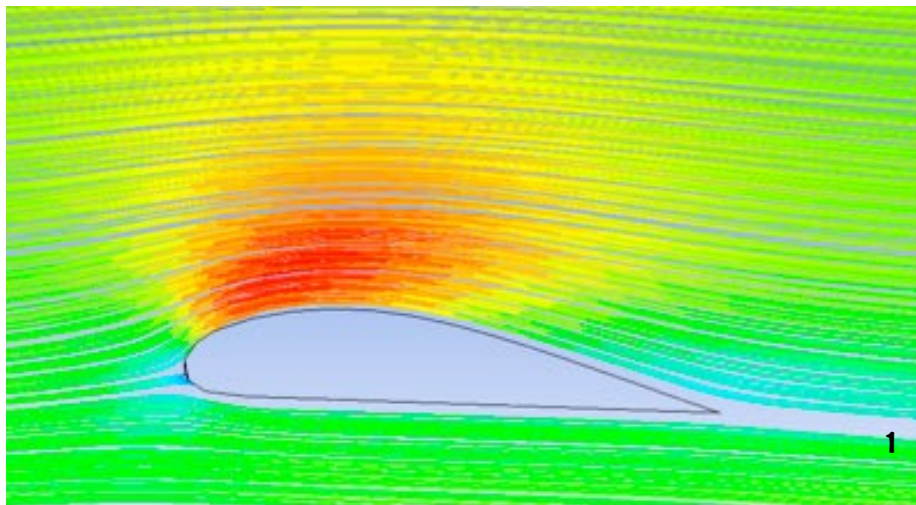


Letting go is never easy. Alcoholics, drug addicts, lovers and paraglider pilots all know! I started to write a boring course for you about stalling. Then I tried doing it on a paramotor and suddenly it became a whole lot more interesting! So let's approach stalling here, bit by bit on a paraglider, and then on a paramotor. The comparison is surprising.

*by Sylvain Dupuis  
translation by Ruth Jessop*

**AUTHOR**  
**SYLVAIN DUPUIS**

Twenty five years old, he's been flying for five years at every possible opportunity, on a paramotor as well as on a paraglider. Sylvain studied aeronautics at ESTACA (one of the most prestigious engineering schools in France) and he is an engineer at Price Induction who make engines for small private jets. An experienced paramotor acro pilot, he describes for us, in his own words, everything you need to know about the total loss of lift – and getting it back...



**A** stall is a sharp increase in drag mixed with a sharp loss of lift. There is no two ways about it, you fall! On a wing with a standard profile, the stall continues as long as the angle of attack is more than about fifteen degrees. It's incorrect to say that a stall occurs due to a lack of speed. It occurs because there is too big an angle of attack, lack of speed being an effect not a cause. Let's analyse the profile of three different angles of attack:

**1-** At 5° angle of attack, the lift and the drag will be quite weak. The flow lines follow the profile perfectly. To generate enough lift to carry the aircraft, you need to go faster.

**2-** At 15° angle of attack, the lift and the drag are stronger. Flight is now slower. The flow lines start to lift off at the back of the profile, creating a bit of turbulence. In a plane, you can sometimes feel this turbulence through the joystick which starts to vibrate.

**3-** After 15°, the profile stalls sharply; the flow lines do not follow the profile at all. The drag here is much stronger, whilst the lift has disappeared; the aircraft is no longer supported.

#### **FALL, TO RECOVER BETTER**

So why stall? In a paraglider, as in a paramotor, mastering the stall can be very important because, when everything is going wrong, it can act as a way of resetting the glider, putting everything back to zero so that you can start again with everything correct, stable and working. This article is principally aimed at two types of pilot; those who like to have their heads in the clouds and who fly in the big stuff (very strong thermals) and those who like to have their heads below them, acro pilots. In thermic conditions as with acro, you can end up seeing your wing in unusual situations, such as an enormous cravat following a collapse. If the cravat is small, it is possible to undo it using the stabilo line. On the other hand, the cravat can be so big that it prevents the wing from re-flying correctly (strong drag and therefore the risk of a stall or auto-rotation etc). Often a stall lets us get rid of the biggest cravats and to get the wing back flying correctly. A stall correctly managed is a relatively stable manoeuvre, also allowing acro pilots to untwist themselves without the wing going everywhere for example.



**DANGER !**

Reading these last few lines, you'll have realised that mastering the stall gives an extra level of safety. That doesn't mean that the stall is anodyne, quite the opposite! Badly managed, a stall can cause all manner of incidents, collapses, cravats, auto-rotations and even falling into the wing...So this article isn't aimed at teaching you how to stall on your own, but rather helping you anticipate the hows and whys of what you will be doing on an SIV course!

**THE THREE STAGES.**

A stall is made up of three distinct phases, each having their own peculiarities, as well as their risks.

**1** The stall. Obviously the first stage you need to know, the transition from 'I'm flying' to 'I'm not flying anymore'. Here, you need to bring the wing progressively to the stall point, without being rough or too hesitant, and whilst being perfectly symmetric in your actions (harness and controls). It's not that simple! First of all, it is important to be in a good position in your harness. Adjust it so you are in a relatively upright position (forget a supine or semi-supine position). Sit perfectly in the centre, fold your legs so that your heels touch your bottom and finally push your thighs apart so that they touch the lateral straps of your harness. You are now in an ideal position, because you are at one with your harness; you'll be ready to react and feel every movement in the wing. For your first stalls, it would be best to start off on a stable wing like an EN-B which has a good reputation, making sure, of course, that you are in the weight range recommended by the manufacturer.

One last check of where your reserve handle is, put your brake loops round your wrists, take a wrap and pull your brakes right down under your bottom. I repeat: Don't hesitate, be symmetric and don't be rough!

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Photo: Gudrun Öchs / www.profly.org

The feeling of falling backwards is typical of a stall. And once again, this isn't just the case with a paraglider. In a paramotor, it's even more impressive...

The elapsed time between having your hands up and having your hands under your bottom should be 3 to 4 seconds. If you're too fast (rough) you will only brake the speed of your wing, without slowing down your body. With the latter having more inertia, the swing will be greater and more violent. If you are too slow (hesitant), you run a big risk of one having one side of the wing stall before the other and of going into a spin.

So you've got your hands under your bottom, your wing falls behind you (in fact your body overtakes your wing) and you feel yourself falling backwards. This feeling is impressive and really unusual! Don't be taken by surprise; this is the worst moment to give up! Putting your hands up now would be a catastrophe; the wing would dive forward so violently that you could fall forwards into it! Keep your hands locked under your bottom until the wing comes back above your head (be careful, the controls will pull strongly!).

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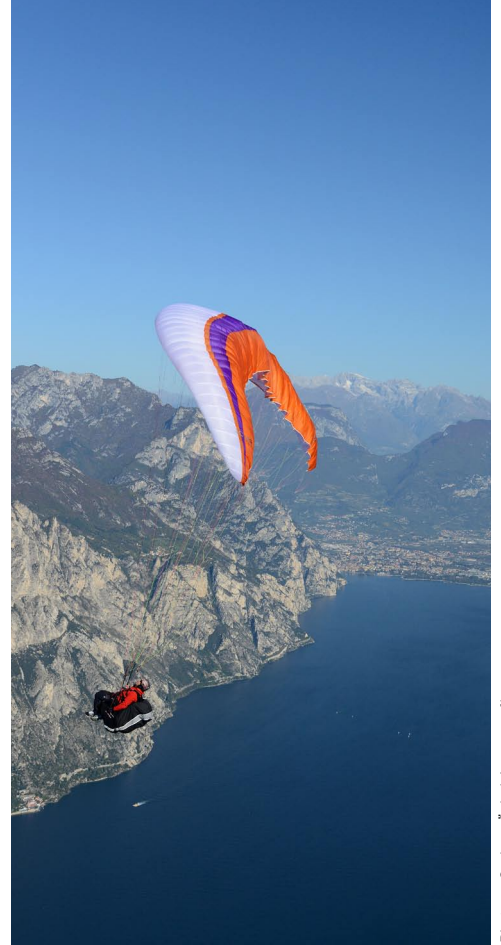
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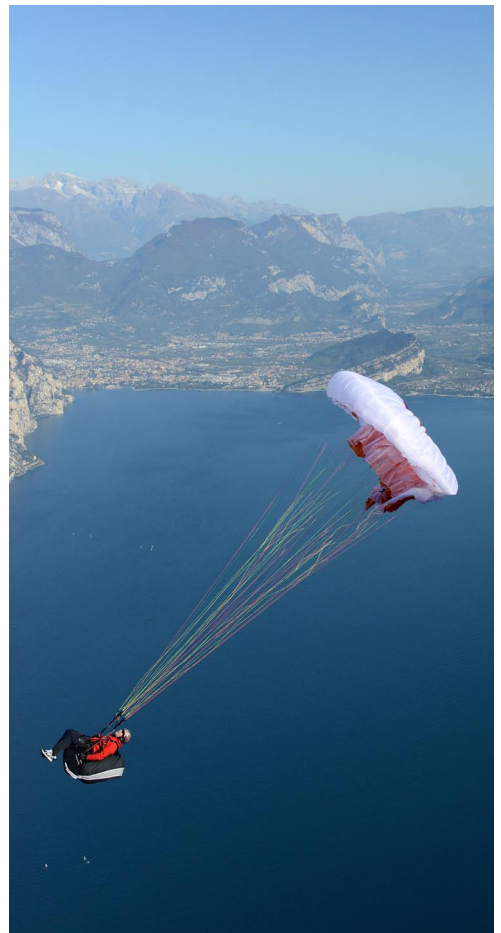
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FLYING TECHNIQUES STALL



A NICE STALL SEQUENCE. THE PILOT SLOWS, SLOWS...THE WING STOPS FLYING AND STOPS SUPPORTING HIM.





Crédit photo: Michel Farrugia - P. Molbert

The wing thus stalled and, restrained by the brakes, thrashes about like a fish out of water. It's a very uncomfortable situation to be in. Stay huddled in your harness and let the wing do what it wants without trying to counter it. Here, your course isn't a priority.

Find reverse; you need to calm this thrashing fish! With so much already written, you'll probably think that about thirty seconds has already elapsed. In reality, the phase where your hands are locked under your bottom only lasts a short time, about two seconds. This is the time that it takes the pendulum motion to do its job and bring the wing back above your head. To calm this disagreeable situation, all you need to do is lift up your hands to the height of the karabiners (still with a wrap).

Of course, all that depends on the wing and how it is adjusted, but it's generally true for a factory wing where you are in

the weight range. Still huddled up, let your hands up, neither too slowly, nor too quickly, always with the aim of being symmetric in what you do. You'll see the difference instantly. The wing won't fight any more, or seem like a rag; in short, the situation is relatively stable. What's new is that you'll see the wing tips folded back, a bit like when you do big ears, but the other way around; they are folded towards the front! You've found reverse (or safety reverse). You're flying backwards and you'll feel the relative wind on your neck. In fact, with a certain amount of brake (hands at the karabiners), your trailing edge will become your leading edge and vice versa. Your sink rate has slowed down. This is the phase I mentioned at the beginning, saying that it allows you to untwist or to pump out cravats. The more you raise your hands the more stable the situation is, but be careful! There is a point not to pass because, if your hands go too high, the wing will want to start flying again, sometimes in an asymmetric fashion! Keep a safe margin!

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2 Re-flying. Here your worst enemy is hesitating. It is tempting to say 'OK, gently does it, that'll be less violent'. Big mistake! By letting your hands up gently, you'll encounter the same risks, notably the potential for asymmetric movements, one side of the wing to fight and start flying again before the other, collapses, twists, another stall... The best possible way to start flying again is to, with your hands, find the position which gives stable reverse flight, and where the wing is slightly in front of you! It is at precisely this moment that you should, in one movement, raise your hands, not forgetting to release your wraps!

The surge will be less if the wing is in front of you when you are flying in reverse, as that limits the pendulum effect. The more the wing is behind you, the stronger the dive will be, and the more brakes you will need. (A reminder about damping the wing: Give a short hard pull on the brakes whilst the wing is at 30° in front of you, not before). When the wing starts to fly again,

it does so very rapidly and you'll have the sensation of being pulled upwards and forwards, as if a hand is pulling you by the stomach. Be really careful not to brake the surge too early at the exit of the stall because your wing has zero speed (maybe even negative, because you were going backwards!) At this stage it would be very easy to stall again if you stop it regaining the speed that it needs! If you stall again, don't panic; start again from the point where you are trying to find reverse.

So that is how you do an ideal stall on a paraglider with a pilot who is within the weight range of his glider, with a nice wing, in nice conditions and with a pilot who isn't very stressed; in short, perfect conditions. Does that tempt you to spice things up a bit? Good. So, take the same nice wing, the nice conditions, the same pilot, still not too stressed, but increase the all up weight by 20 odd kilos by adding a paramotor. At 105 kg my Dolpo S leaves its EN-B certification by going over the maximum weight by 20 kg.



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AS SOON AS THE WING GOES INTO REVERSE THE WING TIPS GIVE AWAY THE NEW RELATIVE WIND DIRECTION... IT COMES FROM BEHIND...



**VROOM !**

I go up to 1200 m, a height that I judge sufficient to be safe if things go wrong. I have chosen to be above a fairly dense forest, always more welcoming than a field in case of parachute failure (you can never be too careful). If I find myself under my reserve, I have several options of clearings to land in on my Rogallo steerable reserve.

OK you know the routine. Trim everything, reserve handle at the ready, get into the middle of the harness, fold your legs, take a wrap, take a deep breath and off we go! The Dolpo goes behind me, then begins to stall, starting with the wing tips, and finally collapses completely. At the same time, I feel myself falling like a stone, as if nothing is holding me any more! The swing backwards is much greater, but it's the sensation of falling which here is the most impressive! I really feel as if I have found the sensation of doing a free fall jump again! Be careful here: Somebody who doesn't know what they are doing, caught by surprise, could react badly faced with this sensation. The temptation to abandon is really strong, but to raise your hands is the one thing you really mustn't do; the surge would be monstrous! I therefore stay locked in my position. It is really uncomfortable, but I prefer to play safe and to wait until the pitch of the wing stabilises. Here, it is no longer a little fish which is thrashing about, but a real lion which hasn't eaten for three days!

*“Here, it is no longer a little fish thrashing about, but a real lion which hasn't eaten for three days!”*



**AUDIBLE VARIOMETER**

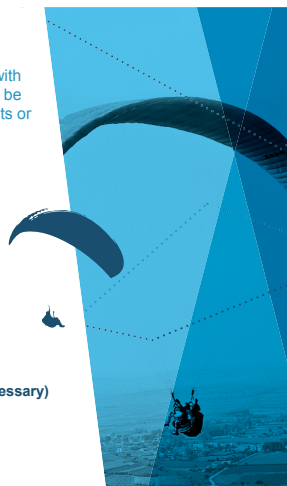
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Once the pitch is stable, I raise my hands to the karabiners. That works and the situation stabilises. On the other hand, I have a bit more difficulty finding a good reverse rhythm. The wing seems to hesitate between re-stalling and starting to fly again, which means that the margin of control allowing the wing to go backwards, is really small! This sensation is confirmed when I put on 5 cm of brake asymmetrically and the corresponding side re-stalls straight away. So we go through a stall phase again to find symmetry and stabilise the situation. Reverse gear is difficult, but it is there.

It's worth adding a little footnote here. During my first stalls on a paramotor, the wing turned sharply but I noticed that the tendency to twist remained small despite the extra mass! I even got the impression that this tendency, was less than on a paraglider. Perhaps this is due to the attachment rods, which play a role in keeping the risers apart.

With the flight backwards nice and clean, I decide to start re-flying. Hands up as soon as the wing is slightly in front of me, and I'm surprised by the feeble strength of the surge -less than on the paraglider! Damping wasn't even necessary here.

Over the next few pages, you can follow step by step the stages of a stall, one on a paraglider, the other on a paramotor...



Photo : Manuel Fasser



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Photos Gopro: Sylvain Dupuis



Sit in the middle of the harness, legs folded, thighs apart, 1200 m of clean air below, take your wrap and off we go.

1



Braking needs to be even, perfectly symmetrical and without hesitating.

2



Here, the pressure applied to the controls starts to be heavy; this is a difficult point to get past.

3



The wing starts its stall. The Dolpo has the peculiarity that it clearly starts to stall from the wing tips.

4



A pretty rag isn't it? Notice the position of the sun here compared with the previous photo, it shows the swing backwards.

5



Careful! Swinging backwards means you'll pendulum! If you put your hands up at this stage, the wing will start to fly again, violently. The pendular conversion will be combined with an aerodynamic conversion, the surge will be very strong and you could fall into the wing! Keep your hands locked until the pendulum movement has calmed down.

6



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When the wing is once again back above your head, you can raise your hands, symmetrically and progressively and it will gently recover.



The more you raise your hands, the more the wing will open, and recover. At this point you're still not going backwards.



You've put your hands up a bit more. Careful, this needs to be done centimetre by centimetre!



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When at last, you find reverse, your hands will be up at the karabiners. Note the wing tips, folded up the same as during big ears, but facing forwards! The wind is from behind. Here you are in a stable, comfortable position.

10



Take advantage of this moment to gather your thoughts, have a coffee, read the newspaper...

11



If you pull your hands down a few centimetres, the wing does big ears, the rate with which you fall accelerates and the situation is a bit less stable.

12





Thanks to the reverse wind, cravats can be blown out.

13



Put your hands back up to the karabiners to re-inflate the canopy and prepare for it to re-fly.

14



Remember that the slightest error in symmetry with the brakes will be felt directly by the wing.

15

Maillon Rapide

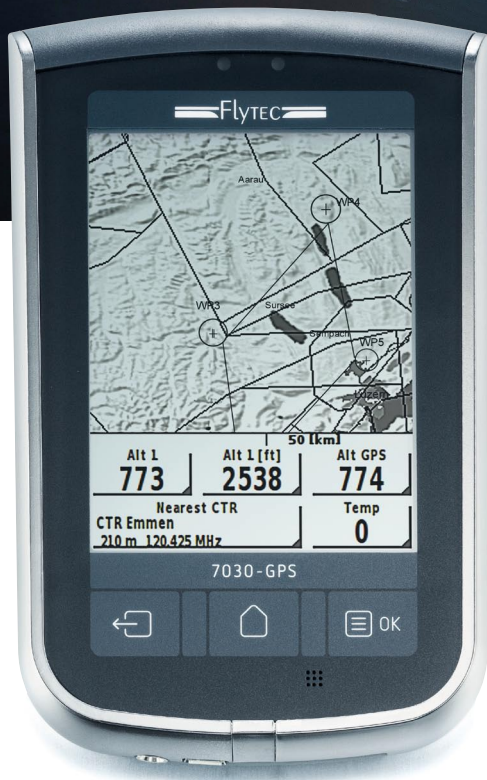
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I regain my symmetry.

16



When the wing seems correctly re-inflated, and as much of it in front of me as possible (here you can see the horizon), I put my hands up straight away, not forgetting to undo my wraps.

17



The wing automatically surges so that it can fly again. You will feel yourself pulled upwards and forwards. Be careful not to brake too early because, at this point, the wing will have very little speed and it will easily re-stall. If that happens, go back and start again calmly from number 4!

18



The surge can be strong, depending on your wing, your all up weight, the moment of recovery etc.

19



The wing in front of you at 30°, damp it with a short hard pull on the brakes!

20



...followed by hands up immediately.

21

# ...and a stall on a paramotor...



Get into the middle of the harness, legs crossed, thighs apart, 1200 m of clean air below, take a wrap and off we go.

1



Braking needs to be even, perfectly symmetrical and done without hesitating.

2



Here the pressure put on the controls starts to be heavy; this is a difficult point to get past.

3



The wing starts its stall. The Dolpo has the peculiarity that it stalls from the wing tips.

4



This is the start of the fall, the heavy pressure on the controls has eased and the wing passes behind the pilot.

5



The lift disappears; the wing is now totally stalled.

6



The pilot slows down the swing backwards. Note the difference in the position of the horizon in this photo compared to the first one.



This picture was taken at the moment when the swing backwards was the strongest. The sensation of free fall is very impressive here. Keep your hands locked because...



...looking at this picture, you'll notice that the horizon has gone back to the right place: that's the pendular conversion. Don't put your hands back up!



Keeping your hands under your bottom, the position is uncomfortable because the wing oscillates on all axes in a very anarchic manner. Now you're going to progressively raise your hands.

10



To calm the situation, you need to raise your hands evenly and symmetrically until you find reverse. Here we start to see the wing progressively re-inflate. The situation stabilises, the ears are folded towards the back and you start to fly backwards.

11



Flying backwards becomes more and more stable; you can feel the wind coming from behind.

12





Hands at the karabiners, the situation is now stable and you're flying backwards. You can gather your thoughts. Between photo 10 and this one, about two seconds have passed; it happens very fast.

13



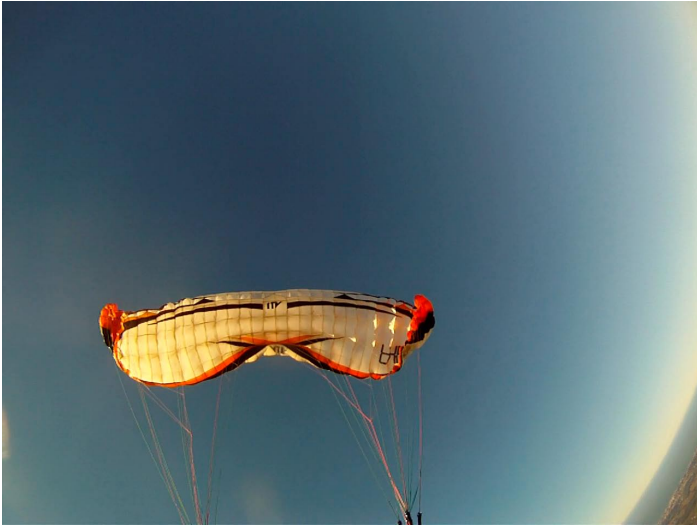
As I mentioned already, the stall is more technical on a paramotor, due to the extra twenty kilos. Here you can see a slight asymmetry; the level of my left hand is lower...

14



...this slight asymmetry is enough to make the left hand side of the wing fall back.

15



You need to rectify this asymmetry in order to fly backwards cleanly, either by releasing the side which has got too much brake, or by pulling more on the side which has too little.

16



Hands up just a few centimetres and the wing re-inflates a little bit more. Here it is on the verge or re-flying. The wing is, at this point, slightly in front of the pilot, which is the best time to start flying again...

17



We put our hands back up (not forgetting to undo the wraps)! The wing stops surging almost immediately.

18



The wing re-inflates; wait before braking!

19



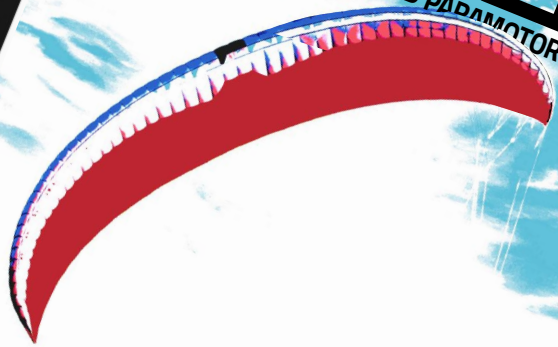
With the wing at 30° in front of you, you can damp it out with a short hard pull on the brakes...

20



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