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## Deep Stall And Big Ears - Nigel Page

This article replaces an earlier article about deep stall alone. Problems with big ears often seem to result in stall conditions.

### What is deep stall?

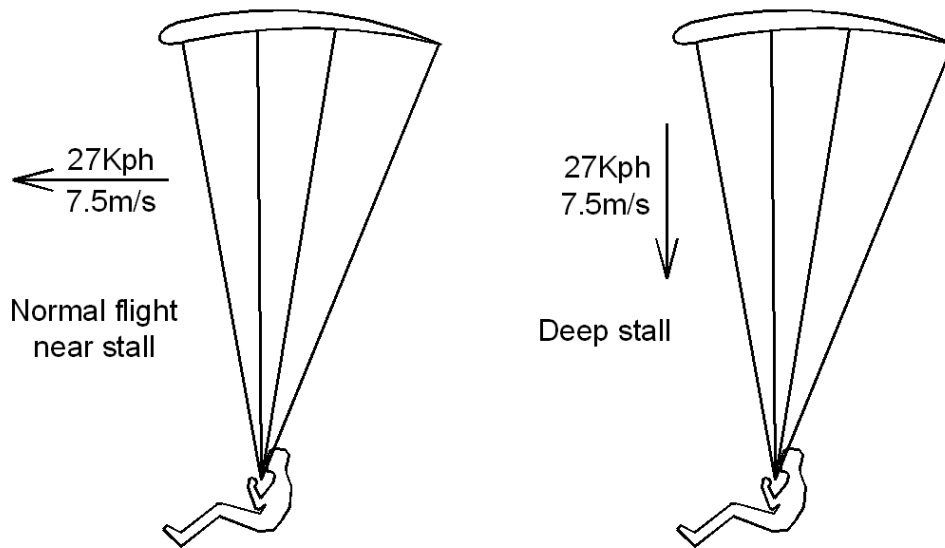
On a paraglider a deep stall, sometimes known as a parachutal stall, is a stall from which a paraglider will not automatically recover when the brakes are let off fully. A stall which requires some brake to be kept on to sustain it is not a deep stall. Forward airspeed is lost and the canopy descends rather like a parachute and usually remains inflated. The rate of descent may exceed six or seven metres per second, faster than an emergency parachute. A modern certified glider will only deep stall if it is faulty, usually porous, or with some stretched or shrunk lines or if it is wet. Flying in the rain can be very dangerous.

### What makes a susceptible glider enter deep stall?

Depending on how we fly and what air conditions are like we may sometimes stall or almost stall our glider briefly without being aware. If our glider is susceptible to deep stall these brief or incipient stalls may become deep stalls.

### Recognising deep stall

The thing which makes deep stall especially hazardous is that it can be difficult to recognise because the falling speed of a paraglider in deep stall is similar to its forward airspeed in normal flight.



The pilot may 'feel' the airspeed but not recognise that it is in the wrong direction. Vertical! The give-away is that serious sinking feeling, the ground coming up and the scream of the vario, but it may still be mistaken for badly sinking air.

### Action in deep stall

If we are low and think we are in deep stall the safest action may be just to PLF or throw our emergency parachute. Otherwise if we have plenty of height we might attempt a recovery. Our paraglider manual may have a specific recommendation on how to do this but most importantly:

### Check The Brakes Are Fully Off

If we normally fly with any wrap in the brake lines we must let it off and make sure the brakes really are as high as they can go.

This may be sufficient to recover to normal flight. If this does not work other methods are pushing the speed bar, pushing forwards on the front risers to pitch the wing down, or weight shifting to one side. Bear in mind that all attempts at recovery may fail and be prepared to use your emergency parachute while you still have plenty of height.

Remember that deep stall is a symptom of a faulty glider. If you think you have had a deep stall you should get your glider checked.

### Big Ears

The use of big ears is sometimes controversial as it is thought to be a culprit for inducing stall and consequential deep stall. My feeling is that on early gliders it was very safe but the more critical pitch trim of higher performing

modern wings makes them more susceptible to problems. Let's have a look.

### Read The Manual

Paraglider development is very rapid and there are many potential reasons why big ears might not be advisable on some gliders and there may be particular ways of executing big ears on some types. If the manual for your glider says don't do it then don't!

### Don't Do It Too Low

Big ears is an abnormal mode of flight which, as we have said, can be associated with stalling. It is inadvisable to do big ears low down and similarly it is strongly advisable to recover to normal flight with plenty of height remaining. Some pilots recommend big ears should not be executed below about 300 feet.

### Basic Big Ears

On a normal modern glider with three A lines each side big ears is usually executed by pulling the outer A lines. This may require a long pull and often the A risers are “split” with the outer lines separate to make this easier. Pushing the lines outwards before pulling them downwards may make this easier too. This action folds each wing about a third of the way in from each tip leaving the glider flying on about 2/3 of its' area in the middle. Brake handles are usually kept in the hands but there should be no brake tension. It may or may not be recommended that speed bar is applied simultaneously.

Make sure you pull the correct lines! Pilots have had stressful, if interesting, flights after pulling the outer B lines by mistake.

### Steering

A glider in big ears can usually be steered by using weight shift.

### Sink Rate

The most obvious effect of big ears is that sink rate increases to about 1.5 to 2 times normal.

### Airspeed

Big ears is a two edged sword with regards to airspeed. On the one hand reducing wing area should increase airspeed but on the other there are now two big bags of air hanging from the wing tips. Airspeed usually remains around normal, but will depend on how the wing tips behave on the particular

glider.

## Turbulence

In turbulent air the shorter wingspan in big ears will help to reduce the rolling effect of a gust under one side of the wing. It may also help reduce pitching.

## Wing Loading

Because our weight is now distributed over a smaller area than normal the wing loading is increased which should make the wing less likely to tuck.

## Structural Stress

Paragliders are very strong. However once we are in big ears the load which was on the whole wing now falls on only on 2/3 of it. This means that the lines and fabric are now subjected to about 1.5 times their normal load. Not a big deal in straight flight, but any manoeuvring forces are also multiplied by 1.5. A 3G manoeuvre will put a stress of 4.5G on the materials of a big eared wing. Not only that, but the distribution of stresses on a wing in big ears will be rather different to that of a wing in normal configuration. Limited areas of a big eared wing may suffer stresses rather more than 1.5 times normal. Designers do not often discuss these issues in public!

## Big Ears And Stall

In big ears the surface area of the wing is reduced, the sink rate increases. On a conventional aircraft this would automatically lower the nose and reduce the pitch of the wing. However paragliders primarily rely on pendulum stability which does not benefit from that mechanism. The increased sink rate results in an increased the angle of attack with increased risk of stall and deep stall.

Using speed bar with big ears is recommended for almost all paragliders to reduce the angle of attack and risk of stall, but we should always be wary of the possibility of stalling.

## Exiting Big Ears

Be sure to exit big ears with plenty of height. EN A and most EN B gliders will come out of big ears once the outer A lines are released. Some "High End" EN B gliders and above normally need a pump of the brakes. On some wings big ears will stay in for a while when the A lines are released but gradually slip out into normal inflation.

There can be a risk of stalling as the glider exits big ears. Re-inflation may

suddenly, if temporarily, increase the total drag of the wing causing it to pitch back and potentially stall. This is thought to have been the cause of a number of accidents. To reduce the likelihood of this it is sometimes recommended to re-inflate one wing tip at a time and, again, the manual may be specific. The risk of stalling will, of course, be worse if the wing is out of trim or porous.

On some wings there is a possibility that a small cravatte may remain after exiting big ears which can usually be fixed by a pull on the stabiliser line. A small cravatte should not degrade the behaviour of a wing very much so do not let it distract you from keeping a good lookout or otherwise flying safely.

### When To Use Big Ears

The most common use for big ears is probably to reduce the chances of getting sucked into cloud as we are approaching cloudbase. However we must remember that big ears will only give us a sink rate of about 2 or 2.5 m/s. If we are climbing at 6m/s the extra sink rate obtained by using big ears will not make a great deal of difference to our climb rate, however it may help to stabilise the glider against turbulence a little. In escaping strong lift big ears does have an advantage over spiralling in that we can attempt to steer away from the area of strong lift. Spiralling will give high sink rates, but will not take us away from the area.

If we think there are stalling risks we should only use big ears at a good height and make sure we exit it before we get low.

### Alternatives To Big Ears

Steep turns will increase our sink rate and have the same advantage of loading up the wing reducing the probability of tucking. Low down there is a danger of the pilot swinging into the ground, but if our circumstances are difficult a balance of risk may have to be struck. Steep turns are very safe as long as we don't hit anything or end up doing wing overs.

Some pilots recommend avoiding big ears altogether. I feel big ears is sometimes useful but try to avoid using it near the ground. I am also careful to re-inflate the tips one a time to reduce pitching and to check my wing is flying properly afterwards.

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