



You're working hard to make the most of the small, punchy thermals, slowly working your way up the mountain, you're already thinking of cloudbase and your next glide, when BANG – a big asymmetric collapse quickly turns into a cravatted spiral dive. You check your altitude and decide to throw your reserve...

by Roger Stanford

Reserve Deployments and Down-Planing

Iwrote this article back in 2012, after hearing of multiple reserve deployment accidents during that season (both here and abroad). I've been asked to update and re-submit this to SkySailor as there are still many pilots who either haven't thought enough about deploying their reserve, or planned adequately for each phase of a successful deployment. Enjoy...

After seven years of running SIV courses with Jocky Sanderson and the SkyOut Team, I have seen reserves of all shapes and sizes and witnessed many deployments. I have also experienced the effects of a down-planing reserve and was shocked at how quickly it can happen, as well as the force of impact with the ground (I landed in water, had

I descended on hard ground I would have suffered serious injury).

After leaving flight school, most pilots spend all their time accumulating knowledge and experience on how to stay up and thermal efficiently, go XC, understand the weather and what the sky is doing around them. Other than buying a reserve and fitting it to the harness, often no more thought is directed towards emergencies and reserves until the moment when the pilot needs it.

Visualisation is a tool used by sports psychologists and coaches to help athletes prepare before their event. It has been proven to cultivate not only a competitive edge, but also to create renewed mental awareness and a heightened sense of well-

being and confidence. Pilots who make a 'Visual Emergency Plan' react better in an emergency as they have already thought about and planned the sequence of events that would take place before and after a reserve deployment.

There are four vital stages to consider when throwing your reserve.

Stage 1: The decision to throw

Altitude and circumstance are the key factors in your decision to throw your reserve. If you are at low altitude and suffer an uncontrollable collapse, then the reserve should be thrown immediately. This gives the reserve more time to open into a controlled descent, and the pilot ample time to de-power and bring in the main (more on this during Stage 3).

If you're high when your collapse occurs, and you are attempting to recover the wing into a controlled flying configuration, then you must keep checking your altitude to ensure you can still deploy the reserve if you need to. Recognise what the wing is doing and the effect your brake inputs are having on the collapse/cascade. If your wing is in a cravatted spiral and accelerating, throw your reserve immediately as the increasing G forces can cause you to black out very quickly.

I recommend pilots have an AGL (Above Ground Level) altitude field box on their flight instruments, especially when flying in the mountains. It is hard to judge exact AGL when flying in high alpine environ-



Reserve down-planing: Notice the position of the reserve behind the pilot with the wing actively flying in front

ments, as your GPS Altitude (or QNH Altitude) might read 3350m, but you only have 200m AGL between you and the terrain. Knowing your exact AGL gives you a clear assessment of the situation and reduces reaction time in your thought processes and subsequent action plan.

Stage 2: Deployment sequence

You made the decision to throw the reserve and are reaching for your handle. You must pull the handle and reserve in the same direction as it was put into the harness. If you pull the handle at 180 degrees across your lap then it can get trapped, and handles have been ripped off due to the force applied by a panicking pilot.

Jocky Sanderson teaches the 'Look, Locate, Grasp, Pull, and Throw' technique. He says, "You pull the handle out the way you put the bag in, that's the critical piece. It comes out the way it slides in, and then you give it a healthy throw behind you... and away from you."

Once you have pulled the reserve from the harness, it is important that you pause and take in your position and the direction of travel of your wing. You only have one opportunity to throw your reserve, so ensure you are throwing it away from you, into clean air. There have been many cases of

pilots being twisted and throwing the reserve in front of their direction of travel, causing the reserve to deploy into their own lines and not opening correctly. Throwing away from you will depend on the configuration of your wing at the time of deployment. If you are in a nose-down cravatted spiral, away from you will be towards your feet. If the glider is in 'helicopter' style descent with a slower descent rate, away from you might be behind you... Take the time to give a good hard throw, resulting in the bridle reaching full extension so the reserve can open away from the paraglider.

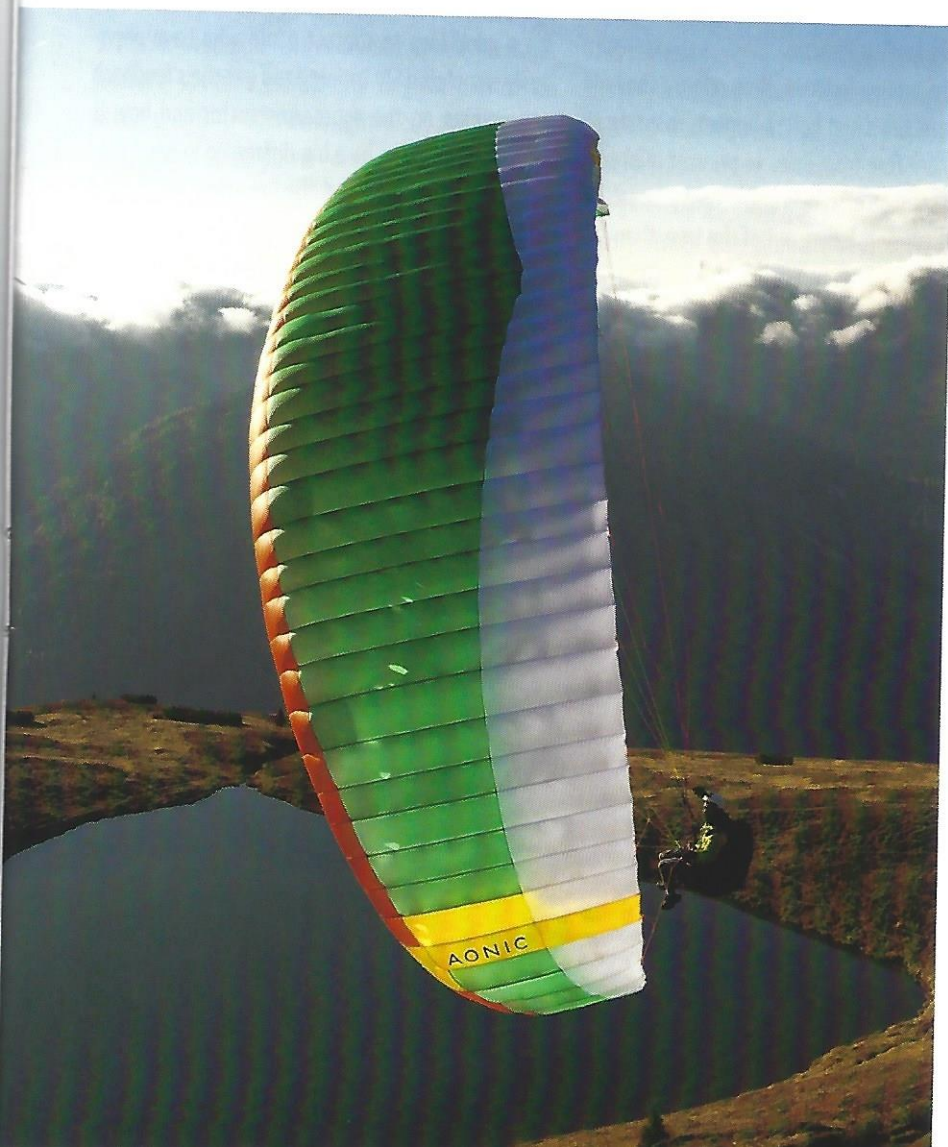
Stage 3: De-powering the main

Whoompf! You feel the reserve open behind you and your canopy starts to dive forward and react to the reserve opening. Now you need to de-power the paraglider, or the reserve will start downplaning/rotating against the flying wing. We previously taught pulling the As to de-power the wing, but no longer do, as it is much harder/more physical to do, due to the As being set further back from the leading edge (shark nose). We now recommend pilots use the 'Comb the Ds' method of de-powering the paraglider. This is done by placing your fingers between the lines on the rear riser (C or D riser, depending on glider) and giving



The pilot can see the glider is rotating to the right, so throws the reserve hard behind and slightly to the left. This results in the bridle being fully extended before the canopy has the chance to open

a good hard pull in a downward motion. This will then pull the trailing edge down, resulting in an extreme angle of attack at the leading edge, and causing the glider to depressurise and collapse. The advantages of the 'Combing the Ds' method is the initial pull is easier than the As, and once the glider is depressurised, it cannot try and reopen,



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Pilot using the brakes method to de-power the glider



making it very easy to pull the lines in until the glider is in your hands.

It is VITAL that you de-power the main and stop it from flying; otherwise one of three things can happen:

- The wing could fly against the reserve, causing it to down-plane/fly to the ground, resulting in much faster a descent rate than under the reserve on its own. Jocky Sanderson and Allan Zoller (Air Turquoise testing house) tested the forces of down-planing and their instruments recorded over 14m/s descent rates!
- The wing begins to fly sideways and rotates around you and the reserve (can occur after riser twists and cravats), significantly increasing the G-force and speed of descent.
- The wing begins to fly into the reserve, bashing it, and causing the reserve to collapse and twist into the main, resulting in you falling to the ground with two collapsed wings above your head.

If you can't de-power the main and gather in the lines, go to your brakes and start wrapping the brake line around your hands until the glider stalls and hangs limply above your head. This method will also allow a slower descent as you have more cloth/fabric above your head providing air resistance.

Note: This method results in lines being wrapped around your hands which can cause significant damage if you land in trees and pressure is then applied to the lines around you.

Stage 4: Landing

You are now descending under your reserve at a rate of 4.5-5.5m/s (average round parachute). Get

into the hang position and brace for impact. Adopt the parachute PLF landing position to reduce the risk of injury on impact.

If you will be landing in water, then release the paraglider and lines which are gathered in your arms just before impact to prevent being 'engulfed'. Unclip from your harness and quickly swim away from all lines and equipment.

If you are landing in trees, then release the held paraglider and lines just before impact, ensuring all body parts are free from lines to prevent injury if/when lines snag on a tree. Brace/attach yourself to branches to prevent falling out of the tree, then call for help.

Knowledge, experience and familiarity with your equipment are the keys to safe flying. Get your equipment out and inspect your harness and wing for airworthiness. Pull out your reserve and get familiar with it. Check the lines as you would your wing. Look at the way it connects to your harness. Practise pulling it out and visualise throwing it away from your body.

Invest in educational material you can learn from during the winter months. Jocky Sanderson's new DVD 'Security in Flight 2' demonstrates all the paraglider collapse and recovery techniques and also has a second disc which covers everything from EN glider testing to locked-in spirals and water landings. Bruce Goldsmith's 'SIV Bible' is another great source of information with in-depth diagrams and descriptions detailing all aspects of paraglider emergencies and recovery techniques.

Of course, nothing beats world-class instruction and first-hand experience gained by attending a SIV course. Since we began running SIV courses

in 2012, other instructors have also begun offering this type of training in a variety of locations throughout Australia. This is a real benefit to the paragliding community and allows pilots from all areas and backgrounds the opportunity to learn skills which could save their lives (and are lots of FUN!). When choosing which SIV course to attend, it's a good idea to contact pilots who have previously completed SIV training and get their feedback and opinion on the course/instructor and how it was run. There can be a big difference in what manoeuvres are taught and the way they are taught depending on instructors.

SkyOut Paragliding runs small group SIV training all year round and teams up with Jocky Sanderson once a year for larger SIV and XC courses. Check our website course calendar for upcoming dates.



Round reserve (apex pull down)

Types of reserves

Most manufacturers these days offer reserves and ongoing maintenance/repack services. Before you choose which reserve to buy, do some research on the net to determine its suitability for you (don't just take whatever your instructor sells). Ensure you buy a reserve which has been tested to your weight range. Small lightweight reserves open very quickly, but can have a high sink rate; large reserves have a lower descent rate, but can have a delayed opening and can be unstable/oscillate during the descent (check what the weight was during certification). There are four types of reserves currently used which include the Round reserve, the Square, the Hybrid and the steerable Rogallos (not including the base canopy used in specially adapted acro harnesses).

Round reserve canopies (Apex Pull Down)

The most common type of reserve. Fast opening, reliable, easy to maintain and pack.

Pros: Very easy to pack, light weight, fast and reliable openings.

Cons: Cannot be steered, higher sink rate when compared to other reserve types.

Rogallo reserves

The steerable reserve. Low descent rate (average 3.2m/s), steerable with forward speed (average forward speed 6.5m/s). The Rogallo cannot be steered until the main is either cut away or has been pulled in/de-powered, or there is a high risk of down-planing. Rogallos can deploy and inflate with a strong turning movement, resulting in riser twists after opening which can prevent steering altogether. Due to low stability and inner pressure, if after opening the rogallo is hit by your paraglider (main not under control/de-powered)

it can easily deflate and get caught up in your paraglider lines.

Pros: Steerable with lowest descent rate of all reserve types.

Cons: Low stability and inner pressure, harder to pack, best used with quick outs and quirky speed bar release, enabling you to fly the Rogallo unhindered by the lines and material of your collapsed paraglider.

Square reserves

This style of parachute uses a square design with corner vents, resulting in a similar descent rate to a round canopy, but in a much smaller and compact package. It achieves this, and increases pendular stability by a sideways 'tracking' motion, which the pilot has no control of. Depending on the deployment situation, this could be a positive or negative aspect of the canopy.

Pros: More stable descent with less oscillations, small volume, fast opening, light, simple to pack.

Cons: No steering, planned deployments need larger safe area due to tracking sideways motion of the descent (applicable when doing SIV over lake or acro over land in the 'training box'.

Hybrid square/round reserves

This style of reserve combines the best features of the round and the square designs, resulting in a fast opening reserve, which has a good descent rate and is very stable. There is some sideways tracking, but marginal compared to a square design.

Pros: Stable descent with less oscillations, fast opening, little tracking sideways, small volume, light, simplest to pack.


Cons: Not steerable, some sideways tracking during descent.



This pilot was forced to throw his second reserve after the first did not open. The reserve was packed too tightly, with the D-bag unable to release the reserve. This was in a controlled environment above water, but would have been life threatening had the pilot been over ground and with only one reserve!

Parachute maintenance

No matter what type of reserve parachute you choose, they must be maintained and well packed for them to work properly. Most manufacturers recommend a repack every four to six months to guarantee a fast deployment and longevity of parachute material. When repacking, the reserve should be hung and aired for two to three days prior to repacking. During this time, you can inspect the lines and parachute material (including attachment points) for any damage or degradation and compare the overall condition of the reserve from the last time you repacked it.

Repacking a parachute is very easy, and I believe all pilots should know how to do it, as well as how it packs into the harness and attaches to the harness/carabiner attachment points. The more you know about your rescue system, the safer and more knowledgeable you will be when using it. 



Rogallo reserve

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Square reserve



Hybrid square/round reserve