Compass AirSports

Reserve Parachutes and their proper use

1.Paragliding and Paramotor Pilots.Basics

Both paragliding and paramotoring are sports and activities that have inherited a lot from the skydiving and hang gliding. We are now able to avoid many fatal mistakes made in the evolution of these ultra-light sports as a whole.

Paragliding and Hang Gliding as a concept

Although paraglider pilots can take much from hang gliding and skydiving there are some important differences in the reserve parachute needs of paraglider or paramotor pilots.

First of all, the most notable difference between a paraglider and a hang glider is the obvious lack of solid structure. In an emergency deployment scenario the paraglider pilot does not have the air frame to aid absorb some of the landing impact or to contribute drag to slow the rate of descent. In addition most hang gliding harnesses keep the pilot prone and slightly above the lowest portion of the frame while paragliding harnesses force the pilot into a seated position so the pilot is the first to touch ground. Hang glider pilots do not have the bulk of lines possibly causing entanglement nor the chance for reinflation if the hang glider is structurally damaged.

The differences between a paraglider and a traditional ram-air parachute sports canopy are only there for the one who knows where to look. The concept of a ram-air parachute is to bring the sky diver to the ground as safely as possible in pretty much most flybale conditions. The paraglider on the other hand is designed to keep the pilot in the air and actually fly, climb, thermal, loose or gain altitude when possible. In an emergency situation the skydiving harness puts the jumper into an upright position where malfunctions occur at a high rate of speed with often enough altitude and a landing field within easy reach. Skydiving main parachutes are cut-a-way prior to reserve deployment. This allows the skydiver to deploy the reserve in clean air above them without risk of entanglement.

2. Considerations pertaining to paragliding and paramotoring

Because paragliders and powered paragliders are often flown relatively close to the ground, paraglider pilots need a reserve parachute that can open quickly and within a very short distance, bringing the pilot down softly. Since turbulence is a primary contributor to paraglider malfunctions, the reserve parachute must be stable and reliable even in adverse conditions. Paraglider or paramotor harnesses must allow the pilot to descend under reserve parachute in a head up foot down position. Based on tests, a pilot impacting the ground seated needs a rate of descent not exceeding roughly 14f/s to avoid serious injuries.

The paraglider pilot should be intimately familiar with controlling their paraglider in less than good conditions. Pilots using a reserve parachute are put in the unique position of having to work with 2 canopies - one "ram-air"being the paraglider and the other "round or else shape" reserve, at the same time. This requires the pilot to make decisions throughout the whole emergency. Nevertheless, once the reserve parachute is inflated it does not mean the pilot is out of danger.

Forseeing the problem...

Most problems can be often avoided by taking some extra care while inspecting your equipment during pre-flight. If something isn't right or looks strange to you, don't be afraid to note it. Double and triple checking during the pre-flight can save your life.

Accidental deployments are not that common any more. Gear has become much safer over the years and yet the pilot has the responsibility to check their equipment before every flight. Many of the accidental deployments were preventable if the pilot was to perform a thorough preflight of their parachute system. Checking the safety pins prior to launch, taking care not to snag the handle while launching or accidentally grabbing the wrong strap when trying to adjust the harness are key.

Some emergency parachute containers require very little input to deploy. This is especially true of a newly packed parachute that has not yet conformed to your body/harness or paramotor frame/ shape.

- **Check your harness/parachute installation**

Verify visually and physically that your reserve parachute is mounted securely to your harness or frame in such a way that it will not interfere with any control movements including your speed bar if applicable.

Verify your parachute riser is attached to your harness via the proper knot or maillon.

Hook knives can be of great help. Better have one handy.

- **Bridle inspection**

Verify the routing of your bridles to ensure no twists. In many cases in Paramotoring, Pilots are known to attach their reserve to one or both of the carabiners used to connect the paraglider to the harness or frame bars. This attachment point is not recommended as an adequate location due to the possible problem of entanglement or the ability to prepare yourself for a parachute landing fall (PLF) with 2 canopies.

In paragliding, verify that your riser is routed in a way as not to wrap around your neck or body during an uneventful or planned deployment. In paramotoring ensure the bridles come from the outside of the paramotor arms and will not tangle around them or around cage segments.

Regularly inspect for damage that may have been caused by dirt, abrasion, or friction. Pay attention to the harness connection loop or maillon and the point of riser entry into the internal or external parachute container.

With most free flying harnesses nowadays, the bridles remain hidden within the harness structure. With Paramotoring on the other hand since bridles are outside, extra slack may occur caused by the riser slipping out of the parachute container. Always verify that the extra bridle is well tucked inside the container. Always fly with appropriate length bridles.

- **Repack every 6 months - 1 once a year.**

Repacking is done as per manufacturer's instructions *and* every time your parachute has seen excessive moisture or heat. Wet fabric is prone to sticking together and thus is likely to deploy slowly. Water content will increase inflation forces. After each repack, your parachute will appear larger. Be sure to squeeze excessive air out of the parachute before you stow and fly if

possible.
If in doubt if you packed it properly, test it somewhere safely. The riser, lines then canopy should come out of the inner deployment bag in a smooth orderly sequence.

- **Don't pack alone if not sure. Seek assistance from an experienced pilot or Instructor.**

Note: **Special considerations for ballistic reserve systems**

- **Regularly inspect your inner deployment bag and rubber bands**

If your deployment bag has rubber bands, replace them if needed. While repacking , keep the inner bag away from the sun as grommets may hear up and melt the fabric or the rubber bands. Pack it indoors. Do not double stow (wrap them around the lines more than once). Apply the appropriate size rubber bands as recommended by the manufacturer.

- **Inspect grommets**

Brass grommets show a chemical reaction with rubber bands that quickly deteriorates the rubber. If your deployment bag has brass grommets, consider updating your deployment bag or at the very least changing to nickel plated grommets. Brass can corrode if poorly kept.

- **Inspect deployment bag handle**

Ensure it is securely mounted to the deployment bag, reinforcement at the attachment points is intact, and the curved pin properly attached to the handle.

- **The handle pins**

They are normally curved and smooth with the end rounded. They may be made from solid wire or die cut. Clevis straight pins were often seen on older reserve systems but are now outdated. Inspect safety pin holders

Verify the safety pin holder loop is tight enough to hold the safety pin without slipping. The safety pin holder should be secured around the safety pin shaft only. If the holder slips above the shaft to the safety pin attachment on the handle, it may not deploy.

- **Verify the release system**

Be sure the safety pin releases before tension is placed on the deployment bag. If it is an external container, it must be securely attached to the harness or paramotor arm or frame. Must not wobble. Always practice deployment on a simulator when possible.

RESERVE PARACHUTES are not 100% perfect in every situation and yet, one must never fly without a reserve parachute when planning a real flight …

Based on the many tests, factory recommendations and incident investigations over the years, it has been universally accepted and established: - Minimum altitude needed for a standard rescue system(reserve parachute) to deploy and slow the descent to a life saving descent rate is 60m-100m(196ft-328ft). Minimum altitude needed for a standard rescue system (reserve parachute) to deploy and slow the descent to a point where the pilot is to walk away with no or minimal injuries is 150m(492ft). Every situation is different and subject to many factors. Rescues are known to have worked and saved lives in much less time and much lesser altitude than generally accepted. Rescue parachutes are not perfect but in most if not in every situation where a rapid uncontrolled descent can occur, having a reserve tool is a must by all safety standards. NEVER FLY WITHOUT A RESERVE when going beyond your small training hill.

Always know your limits and gear. Don't mistake "bump tolerance" with "gear tolerance". Some pilots believe they can do anything because the reserve parachute will save them if they get in trouble. This is not true. Sometimes, even if parachutes are properly designed, packed, rigged and maintained, they just may not work.

Before Every Flight:

1.Preflight your parachute:

2.Check your safety pins

3.Ensure your handle loop is accessible.

4.Verify your riser routing, ensure slack has not slipped out of the parachute container.

5.Verify your parachute container. Be sure it is well closed.

6.Be sure you have easy access to hook knife, recommended.

3. Should I deploy

Deciding whether to deploy or not is often a few seconds decision. The closer the ground the less time you have to make that decision. At enough altitude some situations may correct themselves while others can only worsen. Remember the golden rule in Light Aviation. Altitude is "safety". Mid air collisions, serious line entanglement, structural failures, increasingly violent surges, unrecoverable major canopy collapses or a complete loss of control of the paraglider are all situations to consider the use of reserve. A lot also depends on your familiarity with your equipment characteristics, weather conditions, terrain where you are flying and of course your proximity to the ground.

Paraglider and paramotor pilots should consider the critical altitude below which they may no longer attempt to save the situation and automatically go for the reserve. A critical altitude of 500ft/150m is universally accepted to be that critical point. It is important to note how much altitude you can expect to lose before your reserve parachute will be fully inflated. Opening distance is a function of fill volume, the larger your parachute the more air is required to fill up the canopy. The longer your parachute riser and lines, the more altitude it will take to reach full riser-line-canopy extension and the higher your critical altitude becomes. How and where you throw your reserve will play a vital role. A bad scenario is dropping your parachute directly below you. In this situation your mass has to axellerate below the falling parachute and "anticipate" a full riser-line-canopy extension before you have a chance of descending under an open canopy.

4.Deploying your reserve system

Steps:

1. Find for the deployment handle. Paraglider and paramotor harnesses have a number of adjustment straps that can easily be confused in an emergency situation. Be sure to pull on the correct handle. Handles are normally bright colored for easy identifying.

2. Grab the handle securely.

3. Pull the handle out and away from you. May require a downward motion or a peeling action, to dislodge the pins and velcro. Simulator practices are very useful in these scenarios.

4. Find the clear air. Avoid any lines or paraglider sail that may tangle with your reserve parachute.

5. Throw hard the deployment bag into the clear air. Riser should come to full extension followed by lines and canopy. A good throw will result in a quick inflation. Anything less may result in entanglement . Some distance is needed before your body weight loads your parachute so it can open. Be prepared for a brief "free fall".

6. If possible, shake off the riser and the lines. This will help to spread the suspension lines and open the air channel if your canopy has not yet inflated.

7. In some cases you may even need to pull the reserve back and re-throw

8. Prepare for impact if too low.

Parachute is open. Now what?

Prepare for impact in any case. The most common impact approach is to do a PLF. PLF takes proper training and practice. The military alone spends about 2 weeks teaching the PLF technique.

Feet down, legs together and knees slightly bent, toes slightly pointed, arms in, elbows in and eyes 45-50ft ahead, not down.. Allow enough tension and flexibility to protect your bones on impact. Use your legs and body as shock absorbers on impact. Try to hit in a rolling motion with your feet-calf-thigh-butt-side of the torso-shoulder impacting in the direction you are drifting. Arms and elbows tucked in as not to impact the ground. Keep your head tucked in.

- ## PLF Alternative

If it looks like you are going to impact on a steep slope, among boulders or other obstacles consider an alternative approach.

To consider:

1. **The slower the descend rate, the lesser the chances for the glider to continue to fly**

2. Smaller reserve parachutes will bring you down faster than the larger size of the same model.

3. Normally paragliding parachutes and harnesses are not constructed to withstand terminal velocity freefall deployments beyond speeds of 32m/s

4. Your body mass will drift with the canopy

5. Paraglider and the parachute must have a suspended weight loading for the canopy to operate.

6. If you descend fast your paraglider may want to fly in front and below you (down plane).

7. A round parachute will always follow the suspended weight while a paraglider will want to fly the suspended weight. They may aim to become the main canopy. Mirror effecet.

8. Emergency situations are often extreme.

10. Be decisive in your plan and commit yourself to it.

11. Be prepared to panic.

!!!Try to have a back up plan in any case during flying. Anticipate the situation, plan ahead.

5. Coming down from high. Time.

If your paraglider and parachute are in a state of equilibrium...do nothing. Your paraglider and parachute are in a state of equilibrium. Ride it down with the understanding that conditions can change. Slight pilot control movements, body movements or turbulence can disrupt that equilibrium. Watch the paraglider and parachute. Survey your probable impact area and be prepared to deal with it.

If your paraglider is at least partially functional, come down under both your paraglider and your parachute. If you are able to guide your paraglider above your head but away from your parachute as you descend, do so. Be careful not to fly your paraglider too close to your parachute and cause entanglement.

The parachute is carrying much of the load, you may have less pressure in the paraglider and thus experience less control pressure. If needed and possible, disable your paraglider so your reserve alone can bring you down. Two canopies means having two "parachutes" fighting over control of the suspended load. For a parachute to behave properly it has to have a weight loading the canopy. A paraglider needs weight loading as well. Without that weight the canopy will behave erratically. Extinguishing the paraglider allows the reserve parachute to function properly.

Note: The action of disabling the paraglider can cause multiple problems such as total loss of control, entanglement of the parachute with the paraglider, lines of the reserve parachute being cut by the paraglider lines, reinflation of part or all of the paraglider, uncontrollable spinning, lines or sail wrapping around the pilot and tightening its grip as it twists. The pilot may be required to quickly correct one situation while causing a host of other problems.

Warning!!! When pulling in the paraglider do not wrap lines around your hand or fingers. If the paraglider reinflates while you are bringing it in it can tie you up.

Ways to put off the glider:

1. B-line stall and maintain it. A good B-line stall will disrupt the flight characteristics and allow the paraglider to act like a giant air brake.

A paraglider is very sensitive to symmetry. A B-line stall not done perfectly risk yawing pitch oscillations which may bump the paraglider into the parachute or lines. Mirror effect. Pull in the paraglider from one brake line and pull in one end only of the paraglider.

Pro: If the uncontrollable spinning wraps up the paraglider without causing damage to the pilot or parachute, it could disable the paraglider fast.

Con: It could aggravate the situation and cause the paraglider to spin violently while wrapping up. After several twists the pilot can lose all control or even become tied up in the paraglider lines or sail. As the pilot had no input the paraglider can start to unwrap itself. It could fly erratically around the parachute or pilot and cause severe damage.

Pull in the paraglider by pulling in one rear riser until fabric is in hand and continue pulling in the entire paraglider.

Pros: This could work in a down plane situation.

Cons: Any action taken asymmetrically may cause the paraglider to behave erratically. You need lots of time and altitude to pull in the entire paraglider. You need the strength to pull in the entire paraglider and maintain it. It is easy to lose ground awareness.

Pull in both rear risers to pull the whole trailing edge down and tuck it in-between your legs. Use it as a cushion if possible.
Pros: You will be disabling your paraglider in a symmetrical manner which allows you more control.

Cons: It may take much effort to accomplish this task.

Once the paraglider is pulled in, tuck it between your legs.
Use it to soften the impact if possible.

Pros: By tucking the paraglider between your legs you are in a PLF position automatically. It could give you a nice amount of padding for impact

Cons: Accomplishing this task in a reasonable amount of time will be difficult at best. The chance of re-inflation can cause even more serious problems if it impairs the pilots vision or gets loose and flies into the reserve parachute.

If your paraglider reinflates try to fly it with the reserve parachute in tow.

Pros: You may have regained directional control. The more drag you have over your head the slower you will come down.

Cons: If you fly your paraglider into your parachute you can wrap them up and end up descending with no effective parachute or paraglider.

Cut-a-way your paraglider.

If you are under canopy and your paraglider is behaving in a violent uncontrollable manner you may consider cutting one riser or partially disabling the paraglider by cutting lines. Before you attempt to cut away your paraglider try to determine the probability of entanglement worsening your situation..

Pros: It is a quick way to disable your paraglider.

Cons: Chances of the paraglider entangling with the reserve are likely. In trying to avoid a "hard landing" you could be putting yourself in a possible *life threatening* situation.

RESERVE IS OUT AT AN ALTITUDE. CAN WE CONTROL THE HEADING?

Once you have thrown your parachute the real issue becomes that of control. The following approach should be used as guidelines in establishing your own standard operating procedures (SOP's).

Never lose sight of where the ground is!

A WORD ABOUT STEERABLE RESERVES

As in any parachute design the steerable reserve parachute concept has tradeoffs.

To steer a round parachute, vents are built into the canopy. By closing a particular vent the parachute will turn. The vents cause the parachute to have forward speed. The pilot can control the direction the parachute is pointed by turning into the desired direction.

Some of the advantages of having a steerable reserve include increased stability in the parachute design, the ability to land into the wind and to steer yourself away from danger.

The disadvantages are:

You can achieve steerability only after your paraglider is disabled and the process of disabling the paraglider and maintaining a disabled paraglider while you reach for the parachute steering lines can be difficult at best.

Steerable parachutes have a forward glide. If you have no control over which direction the reserve parachute will open you risk the chance of having your reserve glide into your wreckage upon opening.

If you misread the direction the wind is blowing upon landing, or you are unable to steer the parachute because you are busy trying to deal with the paraglider, you increase your chance of a down wind hard landing.

You must remember not to flare at landing. Pulling the steering lines down on a steerable round canopy will cause a harder impact since it accelerates your rate of descent.

If you have a steerable reserve parachute with a single riser you can face a multitude of problems.

A WORD ABOUT PARASWIVELS

If you have a single riser you may want to consider installing a paraswivel in your parachute system. A paraswivel can be valuable if your parachute is descending straight while you are spinning or if you are coming down straight while your parachute is spinning. It could possibly help your situation. The only drawback would be if the paraswivel somehow got tangled in the paraglider lines.

WHAT DO YOU DO IF YOU ARE DRIFTING TOWARDS POWER LINES, WATER OR OTHER DANGEROUS SITUATIONS?

You must try everything in your power to steer clear of danger. If your reserve parachute has a double riser configuration at the shoulders of your harness that goes directly to the reserve parachute, you may be able to pull down on one riser and redirect your parachute that direction. This may require strength comparable to doing a continuous chin up to maintain that input. If you have a single suspension point, you are at the mercy of the wind.

Power Lines: If it looks like you will be descending through rows of power lines, position your body with your chin tucked on your chest, your arms wrapped straight over your head. Try to position your body as narrow as possible in an attempt to clear or bounce off the power lines. If you are stuck hanging from electrical lines do not touch the ground or allow anyone to touch you. Kevlar, spectra and nylon are all conductors. Wait for someone to turn off the electricity before you attempt rescue. If you fly into lower voltage power lines it is possible that you will short them out but don't count on it. Some people who have gotten caught in power lines hanging above the ground have actually gotten out of their harnesses and jumped safely to the ground. Before you attempt such a feat be sure your body movements will not dislodge the parachute or paraglider and put you in a worse situation.

Water Landings: If you think you are going to descend into water, disconnect your leg and chest straps in preparation for jumping free just before you impact the water. Always have your hook knife ready in your hand. Depth perception can be very deceitful over water so look for concrete clues to determine your altitude over water. Skydivers have gotten seriously hurt or killed jumping into the water when they were too high.

If you find yourself under water with your canopy overhead try not to make any thrashing movements. Stay under water and swim away from your impact area. The lines and parachute can easily tie you up under water. Remain calm.

WHAT DO YOU DO AFTER YOU LAND?

Disconnect your paraglider and reserve parachute. Get out of your harness immediately. Have your hook knife ready just in case you get dragged. If you see another pilot being dragged deflate the parachute by grabbing one side of the parachute and pulling it down to the ground.

PRACTICE

The best preparation for an emergency situation requiring the use of your parachute is practice.

In a simulator

The best way to practice is in a simulator hanging from the ceiling. Have your Instructor or a friend swing and twist you around violently while you try to deploy. Practice with each hand. Practice with gloves. (Note how easy it could be for lines to get wrapped around your neck.)

In the Air
At least once every flight practice looking and reaching for your handle. Imagine yourself reaching for the handle with your right hand and with your left hand.

At Home

Picture yourself in your mind's eye performing a successful emergency parachute deployment. Choose various scenarios depicting yourself in a full frontal collapse, a violent spin, a partial collapse close to the ground, a mid air and any other emergency situations you can imagine. In each case consider your options, choose a plan of action, and take yourself step by step through the deployment process. Imagine problems with your first plan and implement plan "B". Be sure to continue guiding yourself through your decision making processes until you are safely on the ground unhooked from your paraglider and reserve. Practicing a successful deployment in your mind's eye increases your chances of responding precisely and accurately to any emergency situation.

CONCLUSION

Each situation demands the pilot to make a judgment call. The better prepared you are with a mental checklist of procedures the greater chance you have for an uneventful deployment. It's the fastest growing light aviation sport in the World. Learn from each other's experience. When you hear about an accident or deployment instead of spreading the word and blame it to "pilot error", imagine yourself in the same situation and figure out what steps you would take to get out of the situation safely.

Know your equipment. Know your limits. ALWAYS fly with a reserve.

Fly Safely! See you in the SKY

The maximum allowable sink rate for the EN system is 5.5m/s while LTF allows 6.7m/s.