



## Accelerated Free Fall Course Notes

### Contents

Introduction	Page 3
Equipment	Page 4
Stability in Freefall, Deployment and Emergency Procedures	Page 7
Canopy Procedures	Page 8
Freefall Sequence	Page 11
Exiting the aircraft	Page 12
Canopy Flight, Landings and Accuracy	Page 13
Malfunctions	Page 19



# Introduction

The Accelerated Freefall Course (commonly referred to as AFF) is a method of skydiving training. It enables you learn to fly your body in freefall maintaining stability and control, maintain the height awareness to open your parachute at the correct altitude, and fly and land your parachute safely and accurately. AFF has largely replaced the old static line method of training whereby the student exits the plane at a low altitude, and has a line connected to the plane open their parachute for them.

There are nine stages in the AFF program. Stage One includes a "Training Tandem" so the course can be completed in ten jumps. However, it is an objectives based course, so some students may need several jumps to attain that stage's objective. Completion of the AFF course is the major requirement to obtain your skydiving "A" licence. Other requirements are the ability to land accurately, ability to pack a parachute for your own use, and the completion of a written exam. When you present this licence to another skydiving operation, it indicates that you do not need an instructor's supervision. You can pack, gear-up, exit the plane, freefall solo and deploy safely, and land your parachute without an instructor's assistance. This brings the cost of your jump down to about \$45 excluding equipment hire.

The completion of the AFF course though is far from the end of your skydiving education. In fact, it is just the beginning. Following the AFF program, you will be encouraged to continue developing your skills, and this continues with the "B" licence instruction program. The "B" licence table will teach you the skills to fly *relative* to your friends in freefall. You will learn the art of *formation skydiving*. There is a varied array of disciplines to learn once you have attained your "B" licence. Your goal may be to learn to *freely fly*, *skysurf*, fly a *wing suit*, compete in *accuracy* competitions, *freestyle*, or *canopy formations*. One thing is certain, you will never stop learning. The key to being a safe and competent skydiver is maintaining currency. Currency is all-important for all levels of experience in skydiving, but it is also true that the less experience you have, the more you need to skydive regularly. Once you begin jumping, you must find the time to jump reasonably regularly, or your skills and safety will go backwards.

At the start of your course, you will be issued with a log book to record all your jumps. This must be filled out at first by and instructor, then by yourself, and signed by another licensed skydiver. This will keep a track of your jumps and experience. You need to take your logbook to the dropzone every time you go skydiving.

Learning to skydive involves learning to manage risk. Every dropzone must follow the rules laid out by our regulator, The Australian Parachute Federation which are designed to minimise the risk. These rules include weather limitations for different experience levels, and the prohibition of consumption of alcohol in the eight hours before a jump.

The first jump of this course is a tandem jump, where your harness will be hooked onto your instructor's specially designed tandem parachute harness. This will be a full dress rehearsal for your first solo jump. You will be required to initiate the exit, perform some practice deployments and height awareness exercises in freefall, then give an awareness check and deploy the parachute. You will show that you can check the parachute after opening, look for other parachutes in the sky, in order to avoid collision, locate your landing area, and perform a landing pattern. Your instructor will give you a hand-on *canopy control* lesson, which will include different types of turns, and lots of practice *flaring* your parachute. Flaring your parachute involves pulling both steering handles down evenly and completely in order to slow down the parachute for landing. On your tandem you will flare the parachute together with your instructor.

## What is dangerous about skydiving? It might not be what you think.

Many people believe that going skydiving means placing yourself in the hand of fate or luck. They believe that each jump has a high chance of your parachute failing and you getting killed. But statistically, this is not the way it happens. By far most fatalities occur because of an error by the pilot of the perfectly good parachute. When you turn your parachute, you actually cause it to dive, and you swing after it, like a pendulum. If you do this too close to the ground, consequences can be fatal. We call this a *Hook Turn*. We are going to teach you to avoid doing these at a low altitude. The other major danger to us is other skydivers in the air. Collisions under parachute or in freefall are extremely dangerous. We will teach you to look out for other parachutists just as you must do when you operate any vehicle at speed. The other danger we need you to be aware of is that of your parachute opening at the time you don't want it to open. And that is when the aircraft door is open, and you are about to exit, or climbing out of the plane itself. If part of your equipment escaped, it could drag you from the aircraft and cause major

damage to both you and the aircraft. This is called a *Premature Opening*. It can be avoided, by always checking your gear before you enter the aircraft, keeping movement in the plane to a minimum, and general awareness of all your handles and pins, and protecting them from getting snagged at all times. So these dangers are all avoidable with training and vigilance. As for a parachute malfunction, statistically there is one in every 8-900 jumps in Australia. But a large part of your training on this course is about learning to recognise and deal with a main canopy malfunction. As for your reserve, you can have a lot of faith in that. It has rarely been used, is repacked and inspected slowly, meticulously and professionally every six months, and has many safety features not practical to have on your main. The systems and procedures put in place in the packing of the reserve have made packing errors almost unknown. You can have confidence in the laws of physics that if you follow the correct procedures you are trained in your reserve parachute will open.

## IMPORTANT CHECKS BEFORE EVERY SKYDIVE

1. WIND DIRECTION AND STRENGTH
2. EQUIPMENT
3. LOCATION OF LANDING HAZARDS

### Aircraft Procedures

Always **approach the aircraft from the rear** to avoid the propeller.

Do not smoke near any equipment, the aircraft, or fuel. Be aware of other smokers whilst wearing or carrying equipment and keep your distance,

Always try to keep your weight to the front of the aircraft.

Inside the aircraft it is important to keep **movement to a minimum** and **protect your handles and pins**.

If you noticed a parachute open, or a pilot chute escaped from its pouch, smother it, contain it, and tell your instructor. If your parachute or part of it escaped from the plane, dive out after it immediately. It would drag you out and could substantially damage both you and the aircraft if you did not.

### Power Failure

Your main parachute can take more than 1000 feet to open, and your reserve parachute needs a minimum of 500 feet. If we had a power failure in the first 1000 feet, we could only stay in the plane and brace for the forced landing. For this reason, we wear our helmets for the first 1000 feet in the plane.

If the aircraft lost power at a higher altitude than this, your instructors may elect to exit. Follow the directions of your instructors if this situation arose.

## Equipment

1. **Harness/Container System.** The harness contains two sections, one holding your reserve parachute, and one holding your main parachute. At the bottom of the harness is a small pouch (called a BOC, or Bottom of Container) which holds your *pilot chute*. Your pilot chute is like a small parachute enclosed at the bottom with mesh. When you throw out the handle connected to the pilot chute into the clean air rushing past you, the pilot chute fills with air and acts like an anchor, dragging out your main parachute, and allowing that to fill with air and inflate. The harness also has your red cutaway handle on the front right hand side, and your steel reserve handle on the front left hand side.
2. **Main Canopy.** This is your primary parachute, deployed by your pilot chute. It consists of nine cells, which are open at the front (the nose) and taper to a close at the rear (the tail). It is known as a *ram-air* parachute because air gets rammed through the open cells at the front. It has droopy sides (stabilisers) on either side which act like the fin on a surfboard, or a keel on a yacht. You steer the main parachute by pulling down on the steering handle (toggle) of the direction you want to go. The toggles are connected to your *brakelines* which are connected to the back corners of the parachute. You can slow your descent rate (*flare*) by pulling both the toggles evenly all the way down. You must do this when you land the parachute.

3. **Reserve Canopy.** This is our emergency parachute which is only used in the event of a main canopy malfunction. It is flown in the same way as the main parachute but it is deployed a little differently. In the event of a malfunction, you must first *cutaway* the malfunctioning main. This is not done using a knife but by a handle on the front right of your harness. It is very important to cutaway the malfunctioning main before deploying the reserve. The reserve is deployed by pulling the silver handle on the left hand front of the harness. This pulls a rip cord which is attached to a pin which is holding in a tightly coiled spring inside a *spring-loaded pilot chute*, which ejects out of your harness, fills with air and drags out the reserve canopy. We take the reserve very seriously. It is inspected and packed every six months by a professional, has none or very little use, and has additional safety features not practical to have on your main.
4. **Automatic Activation Device. (AAD)** Most commonly referred to by their brands, CYPRES, VIGYL or ARGUS. They consist of a microcomputer that measures speed and altitude. If a skydiver passes through a height 750 feet above the ground while travelling at high speed the Cypres will cut the loops that holds down the pin on the reserve ripcord, and the spring-loaded pilot chute will fire out of the harness.

### Other Equipment

We supply an **altimeter** to be worn on the left hand.

**Helmets** are mandatory and also supplied. They are necessary as they may stop you getting knocked unconscious if you hit another skydiver in freefall or the aircraft on exit. They also protect your head in the event of a bad landing.

We also supply a **jumpsuit**, which helps you fly your body, and **goggles** (because it's very windy. You will need to wear sneakers.

### Other Components of the Parachute System

**Pilotchute.** Deploys your parachute as described above.

**Bridle.** Connects the pilotchute to the main parachute and deployment bag. It also has the pin which holds the container closed. When you throw out the pilotchute to the right, it inflates and pulls the bridle away from the container, and pulls the pin which is keeping the container closed.

**Deployment bag.** The bag which stows the main parachute.

**Suspension Lines.** Attach the main canopy to the harness via the *risers*.

**Steering Lines.** These lines run from the steering handles to the left and right trailing edge of the canopy. Steering lines may also be referred to as brake lines.

**Steering Handles.** Usually known as Toggles.. They are located on the rear of the rear risers. The steering handles are used to set the main canopy on half brakes for the opening of the parachute. Once the canopy is open the brakes are released and the steering handles are used to control the direction of flight and the landing of the canopy.

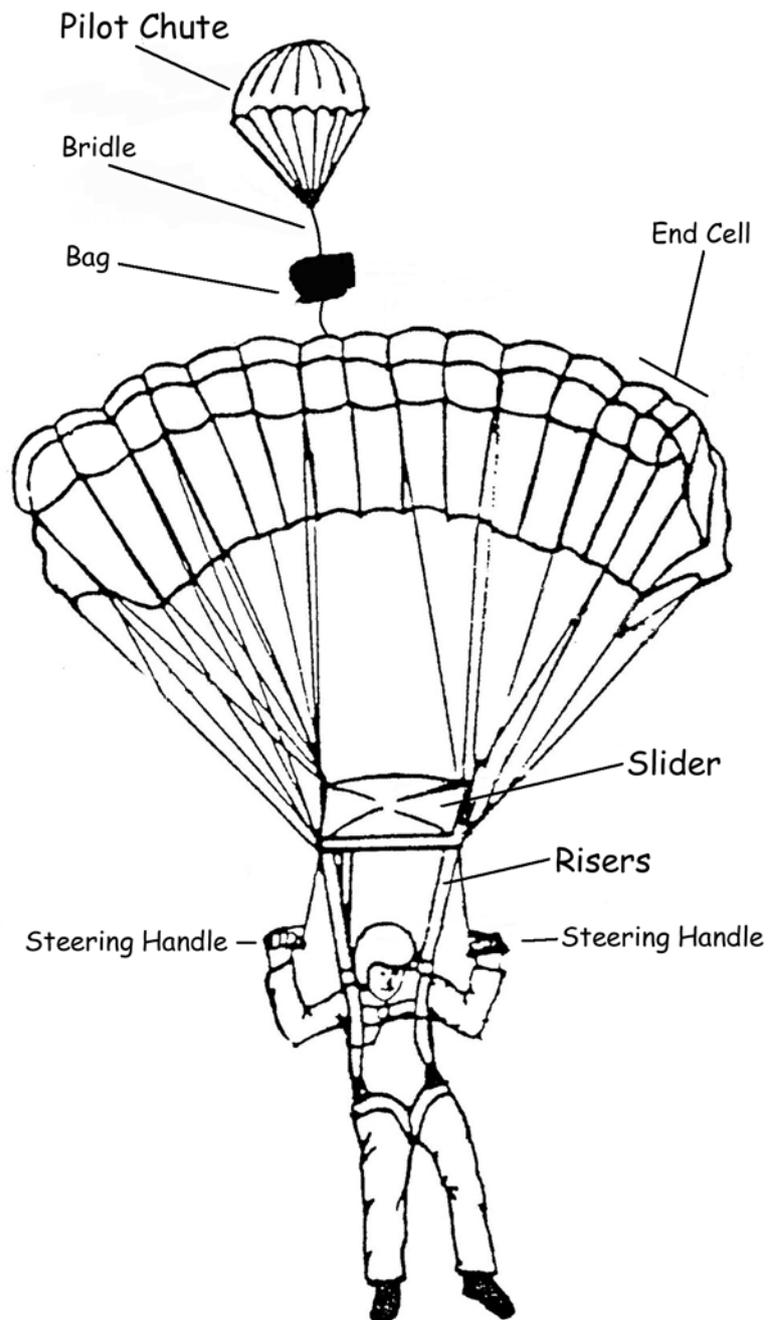
**Risers.** These are lengths of black webbing that connect the lines to the harness via the *Three Ring System*. There are four risers each one connected to its own line group.

**Three Ring System** is the means by which you can jettison or *cutaway* your main canopy in the event of a malfunction. Two smaller rings are attached to the risers, and one larger ring is attached to the harness.. When you pull the red cutaway handle, you are removing the cable that is holding your three rings together, and your weight causes you to fall away from your main canopy.

**Slider.** This is a small square of nylon that slows down the opening of the canopy. It is packed at the top of the lines, thus holding the lines together in their four groups. As the canopy is pulled out of the deployment bag, air starts to flow through the cells making the canopy inflate and spread outwards. The lines need to spread, so they force the slider down the lines until they stop just above the riser. Without a slider, we could not skydive at terminal velocity as the force and speed of the parachute opening would damage both us and the parachute.

**Cells.** The main canopy is constructed from nine units or cells. These are open at the front or leading edge of the canopy and closed at the back or trailing edge. As the canopy flies forward air is forced into the cells inflating the parachute into an aerofoil. The **end cells** are the last to inflate. These must be checked after opening. Pulling down on both steering handles at the same time will have the effect of inflating the end cells and forcing the slider all the way down.

**Reserve Parachute.** The reserve has its own pilotchute, bag, lines, slider, risers and steering handles. The reserve steering handles are red. Flying and landing the reserve canopy is essentially the same as the main canopy.



The major components of the ram-air canopy

## Stability in Freefall

It is important to deploy your parachute from a belly-to earth position because your parachute is on your back. If you deployed your parachute while you were on your back to earth, or tumbling, it would be easy to get your pilot chute and/or bridle wrapped around some part of your body, and the pilot chute could not drag the parachute out of the harness. This is called a horseshoe malfunction. The easiest way to avoid this situation, is to always give your parachute a stable platform to launch from. For this reason, the ability to be able to maintain stability in freefall is one of the major objectives of this course. The only way to be stable in freefall, is to make the shape of an ARCH with your body. HEAD UP. HIPS FORWARD LEGS SLIGHTLY BENT AND TOES POINTED. But be careful not to bend your legs too much. The muscles you should be feeling working when you are practising your arch are the ones at the front of your thighs.

### THE GOLDEN RULE OF SKYDIVING: KEEP YOUR HEAD UP

Especially while you are deploying your parachute

Especially while you are exiting the plane.

Especially when you are coming in to land.

KEEP YOUR HEAD UP!

#### Deployment Procedures

WAVE

ARCH

REACH

PULL

COUNT: 1000, 2000, 3000, 4000, 5000.

Check Canopy.

## Emergency Procedures

"LOOK"	<u>LOOK AT CUTAWAY</u>	BODY STILL ARCHED
"GRAB"	<u>GRASP CUTAWAY</u>	WITH THE RIGHT HAND
"LOOK"	<u>LOOK AT RESERVE</u>	BODY STILL ARCHED
"GRAB"	<u>GRASP RESERVE</u>	WITH THE LEFT HAND
"PEEL, PUNCH"	<u>PEEL, PUNCH, CLEAR CUTAWAY</u>	
"PEEL PUNCH"	<u>PEEL, PUNCH, CLEAR RESERVE</u>	
"ARCH"	<u>ARCH</u>	HARD ARCH

MENTALLY REHEARSE AND PRACTICE YOUR EMERGENCY PROCEDURES REGULARLY, PREFERABLY BEFORE EVERY JUMP. YOU WILL NOTICE THAT MOST EXPERIENCED JUMPERS DO.

FEEL YOUR HACKY HANDLE SEVERAL TIMES IN THE PLANE SO YOU WILL KNOW WHERE IT IS IN FREEFALL. MOST EXPERIENCED JUMPERS DO THIS TOO

## Canopy Procedures

LEARN THE FOLLOWING EIGHT THINGS TO CHECK YOUR PARACHUTE BEFORE YOU COME TO YOUR COURSE!

THREE TO DO WITH THE BIG COLOURED BIT ABOVE YOUR HEAD!  
THREE TO DO WITH THE LINES (THE MIDDLE BIT!)  
PLUS TWO EXTRAS

### CHECK CANOPY

1. Rectangular
2. All cells inflated
3. No rips or tears
4. No broken lines
- 5.No twisted lines
- 6.The slider is down
- 7.The parachute is steerable
- 8.Parachute is flying straight

LINE TWISTS – Scissor kick up to four times if necessary

END CELL CLOSURE / SLIDER UP – Flare canopy up to four times if necessary

MALFUNCTION – Commence emergency procedures

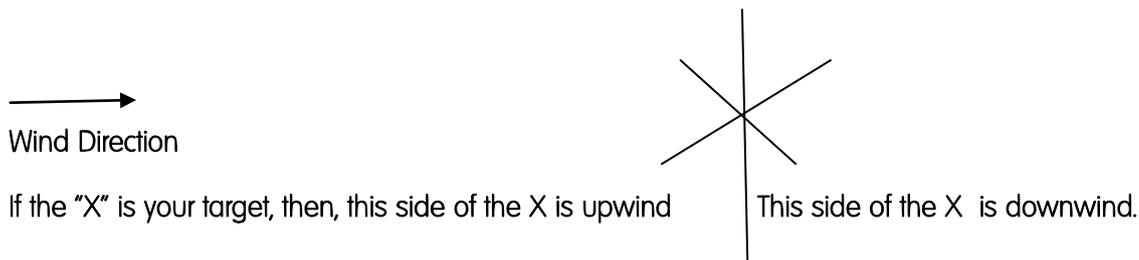
After you have opened and checked your canopy, you need to do the following:

### CANOPY CONTROL PROCEDURE

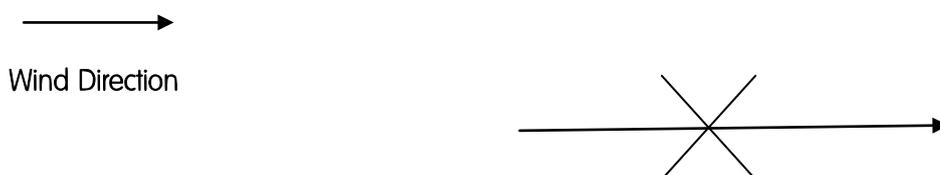
1. Flare Canopy Pull both steering toggles even all the way down.
2. Find and Follow your jumpmaster Locate your jumpmaster and follow him or her back to the landing area.
3. Find and follow the target assistant Listen to your jump master on the radio, or follow the instructions..
4. Flare Canopy x 2 Practice flaring the canopy for landing.
5. 300 ft prepare to land. Follow the radio or baton directions until landed.

### YOUR LANDING PATTERN

Understand the concepts of UPWIND and DOWNWIND.



Understand the concept of the windline.



You will exit the plane upwind of your target. Draw an imaginary line through the centre of your target, in the direction of the wind, and this is your windline. Don't stray too far from the wind-line. We always need the help of the wind to push us back towards the target. We need to turn around before landing at a safe altitude, to land into the wind.

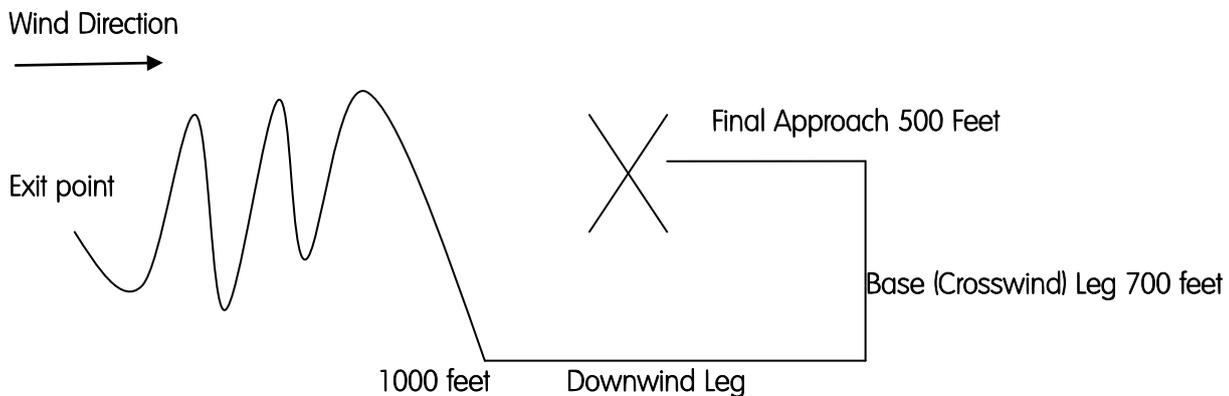
Your basic landing pattern:

STAY UPWIND UNTIL YOUR ALTIMETER TELLS YOU 1000 FEET.

At 1000 feet, START YOUR DOWNWIND LEG

At 700 feet START YOUR BASE (CROSSWIND) LEG

Between 3 and 500 feet, START YOUR FINAL APPROACH

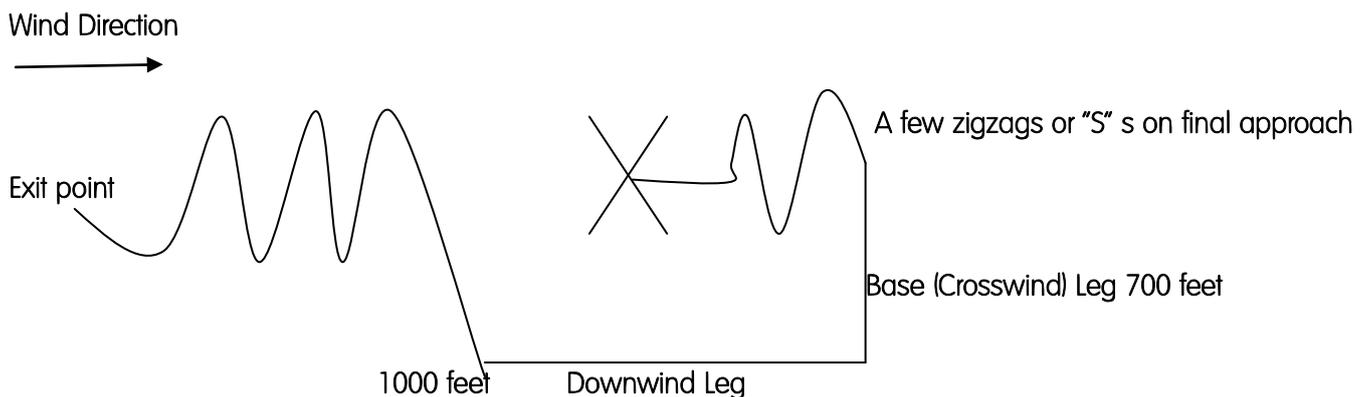


The trick to accuracy is knowing how far behind the target to go to start your base leg, and thus the final approach, as this changes with different wind speeds.

Your parachute has a forward speed of 20kms if there is no wind affecting it. That means if the wind was travelling at 10kms per hour, your speed would be 30kms per hour on your downwind leg, and 10 kms per hour on your final approach.

The less wind, the further behind the target you need to start your base leg.

There is a trick we will teach you to get accurate quickly. Always set up at the point you think is too close to the target. If you go too far behind the target, there is no way of getting closer. If you are too close to the target, there is a safe way to lose that altitude. It is called "S"ing off.



Remember never turn your back to the target under 1000 feet. You should never be more than 90 degrees from the target.

## STAGE ONE (TANDEM) SEQUENCE

12,000 ft	Check in. HORIZON Up. Down. Go
↑	EXIT AND ARCH
10 secs	LOOK AT INSTRUCTOR, HORIZON, ALTIMETER
↓	Read Altimeter
11,000 ft	Practice Pilotchute Pulls X 2 ARCH, REACH, PULL
Approx 20 secs	ARCH, REACH, PULL Hold until you receive a tap from jumpmaster.
	Commence "Circle of Awareness" INSTRUCTOR – HORIZON - ALTIMETER
6,500ft	WAVE – Awareness Check to Jumpmaster
↑	then
6 secs	
6,000 ft	ARCH, REACH
↓	PULL AND COUNT 1,000 – 2,000 – 3,000 – 4,000 Look over shoulder – 5,000 Check Canopy

## STAGE ONE (SOLO) SEQUENCE

Height	Action
12,000 ft	Check in. HORIZON Up. Down. Go EXIT AND ARCH
12 secs	LOOK AT INSTRUCTOR – HORIZON-ALTIMETER
↓	Read Altimeter
11,000 ft	Practice Pilotchute Pulls X 2 ARCH, REACH, PULL
Approx 30 secs	ARCH, REACH, PULL Hold until you receive a shake from Jumpmaster !
↓	Commence "Circle of Awareness" INSTRUCTOR – HORIZON - ALTIMETER
5,500ft	WAVE - Awareness check to Jumpmasters
5,000 ft	ARCH, REACH PULL AND COUNT 1,000 – 2,000 – 3,000 – 4,000 Look over shoulder – 5,000 Check Canopy.

## TANDEM DEPLOYMENT PROCEDURES

6,500 ft – WAVE twice with both arms above head.  
6,000 ft – ARCH, REACH, PULL AND *COUNT*  
1,000 – 2,000 – 3,000 – 4,000 – look over shoulder – 5,000

## SOLO DEPLOYMENT PROCEDURES

5,500 ft – WAVE twice with both arms above head.  
5,000 ft – ARCH, REACH, PULL AND *COUNT*  
1,000 – 2,000 – 3,000 – 4,000 – look over shoulder – 5,000

# Exiting the Aircraft

As we are approaching our exit altitude, and we are five miles from our target, our pilot will let us know that he is commencing the run-in, or jump-run. This is our signal to start to get ready for exit. Turn around first, and get to your knees. Put on first your goggles, then your helmet. Your instructor will check your radio, and turn it on at the point. Please let only your instructor operate your radio. Your instructors will decide the exit point, a process known as "spotting". They will open the door, and when they are ready, call "Power Off". As soon as your instructor starts to climb out, follow them with the following procedure:

It helps if you say the words LOUD while doing the actions.

**Left hand** (Left hand on the strut.)

**Right Foot** (With your right foot, step on to the step.)

**Right Hand** (Right hand on the strut)

**Left Foot** (Bring your left foot out onto the step Chest-strap over the strut.)

**Check in** (Look at the jumpmaster inside the aircraft. He or she will either say OK, and you are OK to proceed, or "Move Forward" if you are not positioned far enough forward with your chest-strap over the strut.. If this is the case, move forward, then check in again.)

**Horizon** (Looking up at the horizon rather than straight down at the ground will improve your arch on exit)

**Up, Down, Arch** (This is the cadence that signals to your jumpmasters the exact moment you are exiting the aircraft. It's like a ready, set, go that can be seen as well as heard. As you step off the plane step straight into your ARCHED

body position. HIPS FORWARD HEAD BACK. THINK NOTHING AT THIS POINT EXCEPT **ARCH**

If you feel your instructors shaking you, ARCH HARDER!

## Free-Fall Signals

### SIGNAL

SHAKE

STRAIGHT FINGERS

THUMB AND FINGERS TOGETHER

BENT FINGERS

THE FIST

### WHAT YOU DO

Arch harder. Hips forward. Head UP

Straighten your legs

Legs together

Bend legs (a little)

ARCH, REACH PULL

## Free-Fall Situations

### SITUATION

### YOUR ACTION

UNSTABLE EXIT

Arch harder

ONLY ONE JUMP MASTER

Continue on as normal

ALONE IN FREE-FALL

Arch – Reach - Pull

## Canopy Flight

The greatest concern of most people making their first skydive is the parachute failing to open. Once the parachute has successfully opened they tend to think that they are out of danger and that there is nothing more to worry about. Your instructors, on the other hand, have great faith in parachutes and are primarily concerned with what happens after your canopy has opened. There are many ways that you can get into trouble and risk serious injury. In order to minimise this risk you need to understand how your canopy works, the effects of wind and turbulence, the specific landing dangers and the hazards presented by obstacles on the ground.

### Aerodynamics

A ram-air canopy is a flying wing. It is composed of a series of cells that are open at the front and sealed at the rear. Air is forced into these cells inflating the canopy into an aerofoil. Forward movement is achieved by the simple device of making the front suspension lines shorter than those at the rear so that the canopy has an angle of attack and glides through the air. Lift is achieved by the decrease in air pressure above the canopy as air flows over the aerofoil. The important point to remember is that parachutes have to be moving forward to work. This means that most of the time you should fly your canopy at full speed with the steering handles up as high as they can go. Full speed may be as much as 15 knots (30 kph). This depends on the size of the canopy and the weight of the jumper. Smaller canopies and heavier jumpers go faster.

To turn the canopy, simply pull down on one steering handle. The steering handles are located on the rear risers. They are attached to the steering lines that run up to the rear corners of the canopy. When you pull down a steering handle you pull down one rear corner of the canopy. This creates drag as it catches air and so it slows down that side of the parachute. Pull the right handle and the right side slows and the canopy turns to the right as the left side drives around at full speed. Turning is simple: Pull right to go right. Pull left to go left. The harder you pull the faster you turn.

Apart from changing direction turning has a very important effect on the canopy. It results in an increase in the rate of descent. This is because slowing one side of the canopy reduces the lift on that side. The other side still has maximum lift so the canopy tilts over or banks in the direction of the turn. As the whole canopy is now on an angle to the ground the lift it generates is not fully vertical but partially horizontal. **Turns increase the rate of descent.** If you are turning when you reach the ground you will hit hard, perhaps extremely hard. The single most important rule of canopy control is: **No low turns.** Low means below 200 feet.

Parachutes can be **stalled**. If you pull down on both steering handles at the same time and hold them down your canopy will slow down to the point where it no longer generates lift and it starts to drop rapidly. This is a stall. Letting the steering handles back up again will end the stall and start the canopy flying again. Quickly letting up the handles is called a dynamic stall recovery. It will make the canopy surge forward in front of the jumper who then swings under the canopy. This is fine at two or three thousand feet but is very dangerous near the ground. Slowly raising the handles up to chest level is called a static stall recovery. This starts the canopy flying again in a more controlled way. This is the best way to salvage the situation in the event of a stall close to the ground. As you can imagine, landing the canopy in a stall can result in serious injury.

A canopy flying straight ahead at full speed (full drive) will have a forward speed of about 15 knots (20kms) and a descent rate of about 15 feet per second (15 kph). That's still too fast to comfortably land. Both the forward speed and the downward speed need to be reduced for a safe landing. You will do this by pulling down on both steering handles just above the ground. This is called the **flare**. The canopy generates a great amount of lift during the flare. As the canopy slows the jumper swings forward and the angle of attack is changed. The lift does not last long as it depends on the conversion of the forward speed of the canopy. Once this is exhausted there is only one way to go and that's straight down. The flare begins at about 20 feet (6 meters) above the ground and is completed just as your feet reach the ground. It should be slow, smooth and controlled. If the flare is too late you

will land with too much speed. If the flare is completed too high you risk stalling the parachute and dropping to the ground.

Flaring takes practice. You can't be expected to judge your flare perfectly on your first jump. There will be an instructor on the ground to give you the signal to flare. Follow this signal exactly. Quite often the flare signal will be in two stages. Stage one is from full drive to half brakes and stage two is from half brakes to full brakes. This is not the best possible way to flare but is the best way for your instructor to deal with the unpredictable response times of different student parachutists. Some students will lag a little behind the signal so the instructor needs to give the signal a little higher to allow for the lag. Others will respond instantly so the flare has to stop half way to avoid the risk of stalling. Remember that if you do flare too high and risk stalling slowly raise the handles a little to keep the canopy flying. Remember that you must keep steering the canopy straight ahead by keeping the handles level with each other.

## Wind

The wind is the one aspect of weather of most concern to parachutists. Rain, cloud and fog can all put a stop to jumping but wind is more likely to be a problem. Until you have qualified for a Parachutist's Certificate you are restricted to wind speeds of 15knots. That's a peak gust of 15kts not an average. Wind is highly variable from moment to moment. The atmosphere is a seething, swirling mass of invisible gas. The stronger the wind the more dangerous this seething mass can be. Parachutists are never entirely free of risk from unexpected gusts, down draughts, willi-willis or rotor turbulence. The risk can be minimised by not jumping in strong winds and understanding the causes of and response to turbulence.

Let's say that a parachute has a speed of 15kts on full drive. That's the **air speed** of the canopy. The **ground speed** depends upon the wind and may be quite different from the air speed. For example if you face your canopy into a 10kt wind you will have a ground speed of just five knots. If you turn around so that you now have a 10kt tail wind you will have a ground speed of 25kts. That's a big difference. We always land facing into the wind to reduce the ground speed and so have a better landing.

Many people have trouble grasping the difference between air speed and ground speed. Here's a simple analogy that may help you. Imagine a speedboat on a lake cruising back and forth at 15kts. The boat's water speed is 15kts. Imagine a man standing on the ground at the shore of the lake. He sees the boat going past at 15kts. The boat's ground speed is 15kts in any direction because the lake water itself is not moving. Now imagine the same boat on a very fast flowing river with a current of 10kts. There's a man on the bank watching the boat chugging upstream into the current. To the man the boat appears to be travelling at five knots (ground speed) although the boat is travelling through the water at 15kts. When the boat turns around and heads down stream with the current behind it the man on the bank sees it go by at 25kts. If a man on the boat wanted to jump onto the bank he would be best advised to do so when the boat was travelling up stream when its speed relative to the ground was minimal.

The wind is much like a current of water moving across the ground. You will travel much faster across the ground with the wind than you will against the wind. And like the man jumping from the boat to the bank you would be best advised to face into the wind when you want to step onto the ground.

The wind also determines the spot where you exit the aircraft on your skydive. You want to be open upwind of the landing area so you can easily fly back with a tail wind. If you open downwind of the target you have to chug into the wind to get to the landing area and if the wind is too strong you won't make it.

Typically the aeroplane flies over the drop zone into the wind on jump run. When the wind is strong the skydivers jump out as much as a mile upwind of the DZ. When they open they check the wind by looking down at the ground to see how fast they are moving. Checking your ground speed while facing your canopy in different directions gives an indication of both wind direction and wind strength. If there is no wind at all the best place to be open is right over the top of the DZ and once open circle around the target. If the wind is strong it's best to open upwind and circle over a point upwind of the target. In either case at a height of about 1000 feet you need to commence a landing circuit. This starts with a downwind leg past the target. At around 500 ft make a 90-degree turn onto the crosswind leg. At 200 to 300 feet make a final 90-degree turn into the wind and fly straight in to land.

To accomplish a safe canopy flight and landing you need to be able to **determine wind direction**. There are several ways to do this. Perhaps the most frequently used is the **windsock**. Make sure you have a look at the windsock

before you get into the aircraft. This applies as much to skydivers with thousands of jumps as it does to those making their first. Use the aerial photograph of the drop zone to relate the wind direction to relevant landmarks. You can also see the windsock from the air while flying your canopy. The windsock has a conical shape like a carrot. Imagine eating a carrot starting at the pointy end. If you are facing into the wind on landing with the windsock in front of you the pointy end should be facing you like a carrot ready for you to bite.

**Ground speed** is an indicator of wind direction that can be used even if you are too far away to see the windsock. Using ground speed has its limits. It only tells you the wind direction at the altitude you happen to be at the time. The ground wind may be different. When the wind is light it can be hard to see much difference in ground speed when facing in different directions.

**Smoke** from bushfires or farmers burning off can provide a wind indicator visible over many kilometres.

Watch **other parachutes** landing. If they have any sense at all they will be landing into the wind. You would be best landing in the same direction as everyone else.

## Turbulence

Few things scare skydivers as much as turbulence, especially turbulence near the ground. Wind creates turbulence as it moves over uneven terrain or ground features such as buildings, trees and hills. These features result in rotors of rolling air much like surf breaking on a reef. The stronger the wind the more dangerous this **rotor turbulence** can be. A parachute can be affected by either the upswing (lift) or the downswing (sink) of rotor turbulence. Obviously sink is more dangerous as it increases the rate of descent resulting in a harder landing.

The best strategy to take is to **avoid the downwind side of large ground features**. Try to land with clear open land in front of you. If you experience a lot of lift on landing you may need to slow down your flare so you don't stall your canopy. If you experience sink you need to flare faster to complete the flare before you hit the ground. Put your feet and knees together and roll to reduce the risk of injury.

**Wake turbulence** can be felt if you fly directly behind and above another parachute. This is of no major concern high up but can be a problem if you land directly behind another parachute. Land off to one side if you are close to another canopy.

**Thermals** can create unstable, turbulent air. Hot days are definitely more turbulent than cool days.

**Wind sheers** occur when air at different altitudes is travelling in different directions. The boundary layer can be quite unstable. Generally this is high enough not to pose any real danger.

**Willi-willis**, whirlwinds or dust devils are a particularly vicious phenomenon. They can strike unpredictably even on cool calm days. If you see a swirling column of dust fly away as best you can even if it means landing crosswind. Like sharks they attack humans infrequently and you rarely see the one that gets you.

## Target Assistant

The target assistant or **TA** is the instructor who gives you directions when you are flying and landing your parachute. On your first solo jump you plan to be open at an altitude of four to five thousand feet. One instructor will open a few hundred feet below you. This instructor will be your first TA. You need to know what colour canopy to look for. You may need to circle a few times and search the airspace below you to locate your instructor. Once you have found the canopy turn your parachute in the same direction. This does not mean that you should aim your canopy at theirs nor do you need to be right behind them. Simply fly in the same direction as your instructor. If they fly south you fly south. If they make a left turn you make a left turn. Meanwhile keep checking the drop zone to see if the other instructor has landed.

Your other instructor will freefall down to about 3000 feet before opening. They will then fly down to the target as quickly as possible. As soon as they land will talk to you on the radio. You will now follow the instructions of the TA on the ground rather than follow the high instructor.

Before making any turns look first to make sure that no other parachutes are in your flight path. Collisions between parachutes are disastrous. Don't rely on other people avoiding you. It is your responsibility to avoid canopy collisions.

Your TA on the radio will direct you to fly your canopy slightly upwind of the target. As you lose altitude you will be directed ever closer to the target. At an altitude of about **1000 feet** you will be directed to fly **down wind** past the target. How far past depends on the strength of the wind. The lighter the wind the further downwind you need to fly. At around **700 feet** you will be instructed to turn onto the **crosswind or base leg**. At around **500 feet** you should be turning onto your **final approach into wind**. You may need to fly back and forth crosswind ("s"ing off) so that you don't overshoot the target.

Once you are facing into the wind at about 200 feet your TA may advise you to "s" off. At this stage all turns should be very minor. Don't be tempted to slow the canopy by pulling down on the steering handles. You need full speed to achieve a good flare. Your hands should be up as high as you can put them before the flare

## LANDING

Landing should always be made facing into the wind. This will slow your speed down for a softer landing. However it's better to avoid a landing hazard with a crosswind landing than to land into wind and collide with the hazard.

**Flare the parachute evenly and all the way down**

## DO NOT

1. DO NOT stall your canopy near the ground (below 1,000 ft)
2. DO NOT let your toggles up quickly near the ground
3. DO NOT attempt radical turns near the ground
4. DO NOT spiral your canopy below 1,500 feet.

**ANY OF THE ABOVE CAN CAUSE SERIOUS INJURY!**

**DON'T LOOK STRAIGHT DOWN AT THE GROUND WHEN YOU ARE COMING IN TO LAND AND FLARING YOUR CANOPY. THIS ALMOST ALWAYS RESULTS IN REACHING FOR THE GROUND, AND A BAD LANDING.**

**LOOK STRAIGHT AHEAD, AND FLARE EVENLY ALL THE WAY**

# KEEP YOUR HEAD UP

## Landing Dangers

Landing is the most dangerous part of skydiving. You can't possibly miss planet Earth so plan on touching down as softly as possible. Hitting the ground too hard is the cause of nearly all parachuting injuries. Here are some of the causes of hard landings.

**Low turns** increase your rate of descent. Don't make any major turns below 200 feet.

**Stalling** your canopy can result in you dropping to the ground. Your flare should start at around 20 ft and finish just as you reach the ground. Watch your TA closely and follow his signals exactly. Half brakes is a safe compromise position.

**No flare** at all will result in a dangerously hard landing. Watch your TA. If you can't see them, listen to their instructions on the radio.

**Down wind landings** result in a very high horizontal speed across the ground. Always land into the wind. Horizontal speed is not as dangerous as vertical speed. If you do make a mistake and find yourself running downwind below 100 feet don't try to turn around. Flare at the usual height, put your feet together and roll.

**Hazards** such as trees, buildings, water, power lines, roads and fences can cause very serious injuries. Always try to land in a clear area. You should take evasive action as soon as possible to avoid an obstacle, the higher the better. It takes only a small turn to avoid a small hazard such as a single tree. A longer hazard such as a road or fence requires a turn of up to 90-degrees. A crosswind landing is better than crashing onto a road or fence. Always avoid flying into a corner such as the point where two roads or fences meet. You are out of options if you are low and heading into a corner. **Avoid hazards at height.** Avoid power lines at all cost. Remember that you are the pilot of your parachute and it is your responsibility to avoid hazards.

If you insist on crashing at least put the brakes on to slow down a little. Put your feet and knees together and keep your elbows in. If you hit a tree cross your hands over to protect your chest and throat and cover the reserve handle to prevent an accidental cutaway. If suspended in a tree, power lines or any other hazard wait for assistance don't try to get down by yourself. In the event of a water landing, loosen leg straps and undo your chest strap. Flare normally, pull the canopy off your head should it land on top of you and get out of your harness, shoes and jumpsuit as fast as you can. Do not try to salvage any equipment.

If you find yourself being **dragged by the canopy** after landing let go of one steering handle and pull the other one. Keep pulling on the steering line until the canopy is completely collapsed. Run around to the downwind side of the canopy so it cannot reinflate. Then bundle it up and walk back to the clubhouse.

## Off Drop Zone Landings

There are several circumstances that may result in parachutists landing away from the usual drop zone. Such events as encountering unexpectedly strong wind, exiting the aircraft in the wrong spot or flying the canopy in the wrong direction can lead to off drop zone landings. This is why it is important to know where the hazards are. Stay away from the road and know where the power lines are.

In the event of an off drop zone landing, your instructor will talk you down with the radio. The first part of target assistance remains the same. Look for the parachute of your instructor flying near you. Turn your parachute to fly in the same direction as that of your instructor. Continue to follow your instructor's canopy until you locate your other instructor on the ground.

The first instructor to land will choose a suitable open area to serve as your landing area. Your instructor's parachute on the ground becomes your target. Follow your landing pattern for your new target. Stick together. It is easier to find three lost parachutists together than separately.

## **Two Important Rules**

*1. Land in a clear area. Long Runway*

*2. Land into wind*

Make a decision early – before 1000 feet minimum, but the earlier the better

No low turns

30ft/10m – Flare to waist

Roll – Parachute Landing Fall – PLF

(A PLF is a good way to land if you think you are going to land hard)

Turn right to avoid canopy collisions.

If you encounter wind turbulence near the ground, quarter brake (**steering toggles to eye level**) will help stabilise the canopy.

When landing near large objects you may sometimes encounter wind turbulence.

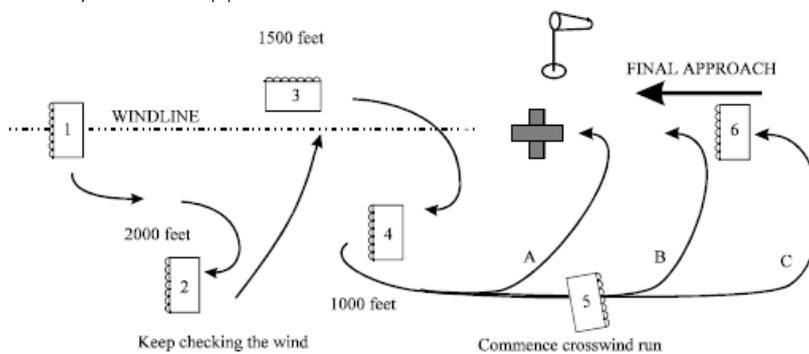
REMEMBER LANDING YOUR PARACHUTE IS THE ***MOST IMPORTANT*** PART OF YOUR 1<sup>ST</sup> SKYDIVE. **IT IS THE TIME YOU CAN GET HURT.**

IF YOU ARE NOT ABSOLUTELY CLEAR ON YOUR LANDING PROCEDURE TELL YOUR COURSE INSTRUCTOR, THEY WILL BE HAPPY TO GIVE YOU ANY EXTRA TRAINING, AS THEY **WANT YOU TO LAND SAFELY.**

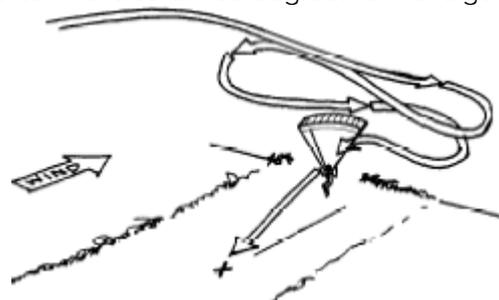
### BASIC ACCURACY

Accuracy is something you can practice on every jump. This will really pay off on those jumps when it is most important that you land where you want to.

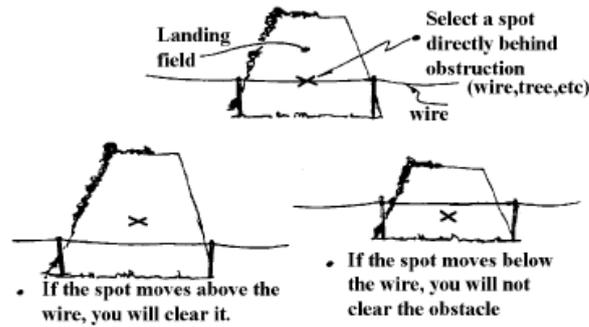
1. You should exit the aircraft and open your parachute upwind of the target. After checking your canopy, flare, and look for your instructor.
2. You can traverse the windline, remaining upwind of the target until you get to 1000 feet. During this time, observe how fast you are travelling over the ground when you are facing into wind. You can use this as an indicator for how far across the ground you will travel on your final approach, but bear in mind, wind speed changes at different heights.
3. At around 1000 feet, start your down wind leg. The stronger the wind speed, the closer to the target you will need to start your final approach into wind. The forward speed of your parachute is 20kms per hour. If the wind is traveling at 20km per hour, you would set up directly over the top of the target. If the wind was at 10kms per hour, you would need to go behind the target, if the wind is nil, you will need to go even further behind this.
4. Start your crosswind or base leg at around 700 feet.
5. You should be on your final approach into wind between 500 and 300 feet.



6. If you are going to overshoot the target, make "S" turns to lose height using  $\frac{1}{4}$  to  $\frac{1}{2}$  brake. Always make the turns facing towards the target. You can traverse at 180 degrees to the target, until you will no longer overshoot.



### Clearing obstacles: (The Accuracy Trick)



You can tell if you have enough altitude to reach a given landing site by looking at an object (eg building/tree/power pole) just in front of or near to the site. By looking at the top of the object as you fly towards it you can see whether the ground appears to be rising or sinking behind the object. If you are going to clear it the ground will be appearing (moving up). But if the ground is disappearing (moving down) behind the obstacle then you know immediately that you are not going to clear it and you need to start looking in front for an alternative landing area. As an alternative to facing the landing area, if you perform this test while side on to the wind (crabbing) it will give you a clear indication of whether you can easily clear it or not just by using the wind speed. **Then you can use your canopy drive to either hold or run to find an alternate landing area.** Of course, real life is often more complicated than that and you may encounter different winds at different heights but you have to start somewhere. (Usually the wind decreases as you get lower.) Continue to use the accuracy trick as you get closer until you are sure you'll make the DZ. If you find you cannot make it back then the accuracy trick lets you make the decision to land out in plenty of time to choose an alternative. With a parachute that needs a longer runway, try to arrive at your chosen out-landing site with enough height to allow you to overfly the field, fly the landing pattern and check for obstacles. Powerlines are particularly hard to see if you fly a straight-in approach (and it is too late if you see them at 30 ft), so the few seconds spent checking an area you may never have looked at before is well worth the few more minutes of walking.

You can use this "accuracy trick" to land on the target as well as avoid obstacles.

## Malfuncions

### Types of Malfuncions

Malfuncions may be **High Speed** or **Low Speed**. If you experience a high speed malfunction you will be losing altitude very fast. You must act quickly as every second is important.

*Some types of high speed malfuncions are:*

**Total Malfunction** where there is no parachute at all. This could be due to inability or failure to pull the main pilotchute or an impossibly hard pull.

**Pilotchute in tow.** If the pilotchute fails to pull the pin and open the main container the pilotchute may trail behind as the jumper continues to freefall.

**Bag Lock** In this case the pilotchute and deployment bag have lifted off your back but the canopy has remained locked in the bag due to a line or line stow problem.

**Streamer** This is where the main canopy has come out of the bag but not inflated to full size. Inflation normally takes only a couple of seconds. If you have completed your count of six seconds and the canopy is still small with the slider invisible or right up at the top of the lines then you have a streamer. Don't wait any longer. Immediately carry out emergency procedures.

**Horseshoe** This is the most dangerous type of malfunction. It may be the result of an unstable body position during main deployment and subsequent entanglement of the main parachute lines, pilotchute or canopy with the body or equipment.

Low speed malfunctions involve a parachute that has opened but has a problem that makes it unsafe to land. Sometimes the problem may cause the canopy to rotate or spin out of control. This dramatically increases the descent rate and landing a spinning canopy is certain to result in serious injury or even death. Low speed malfunctions provide a little more time than do high speed malfunctions but this can be a trap leading you to waste too much time and lose too much height. Make a quick decision and carry out your emergency procedures.

*Some low speed malfunctions are:*

**Line Over** A steering or suspension line over the top of the canopy will result in a visible deformity and probably an uncontrollable turn.

**Broken Lines** You need to closely inspect your canopy to check for broken lines. Any broken line can affect the steering, flaring or descent rate of the canopy.

**Line Entanglements** can cause your canopy to turn or spin out of control.

**Canopy damage** such as large rips in the canopy may affect the performance of the parachute in a number of ways.

**Brake lock** If at first your steering handles don't come free and so release your brakes pull harder and they will almost certainly release. If not you will be unable to steer and flare your parachute so you need to use your reserve.

After throwing your pilot chute and completing your count you must visually check your main canopy. Only you can do this. Once your parachute has begun to deploy you are on your own. Your instructors will be hundreds of feet below you.

Once you have confirmed that your parachute has opened you need to take control and trim it up. The first thing to do is clear any line twists.

**Line twists** must be cleared before touching the steering handles. Grip the risers and scissor kick your legs. You have a 20% chance of line twists on your first jump.

**Release the Brakes** by reaching up to the steering handles on the rear of the rear risers. Pull them both down to waste level and then let them back up to the original position.

**Check the Slider** which should rest at the bottom of the lines just above your head. If it is all or part way up the lines pump it down by pulling down your steering handles.

**Check the End Cells.** These should be fully open and inflated. If one or both of them are not inflated then pump them open using your steering handles.

Line twists, slider up and end cell deflation are not considered to be malfunctions but are minor routine problems that are easily rectified. If at the completion of these checks your parachute appears to be OK then you must land it. You can't change your mind later as you may be too low for a safe cutaway and reserve deployment.

Should you deploy your reserve parachute you must trim it up and follow the Target Assistant in exactly the same way as you would with your main parachute. Look for your instructor's parachute and fly in the same direction as they are. Follow their instructions and land exactly as you would if you were flying your main.

## PRIORITIES OF EVERY SKYDIVE

1. PULL
2. PULL AT A SAFE ALTITUDE
3. PULL STABLE (IF POSSIBLE...IF NOT, REMEMBER PRIORITIES 1 AND 2)

### Skydive Jurien Bay AFF Table – after stage 1

AFF Stage	The skydive includes	
<u>AFF 2 and 3</u> 12,000 feet	<ul style="list-style-type: none"><li>• All your jump training</li><li>• Covers everything you need for your 2<sup>nd</sup> &amp; 3<sup>rd</sup> skydive</li><li>• Learn a relaxed flying position</li></ul>	<ul style="list-style-type: none"><li>• Learn the effects of arm and leg movement</li><li>• Training on the packing of parachute systems</li><li>• Consolidation of your pilot chute throws</li><li>• Flying relative to your instructor</li></ul>
<u>AFF 4, 5, 6, 7 &amp; 8</u> 14,000 feet	<ul style="list-style-type: none"><li>• Skydive with one instructor</li><li>• Solo exits, turns, forward movement, dive exits, back loops, fast, and slow fall rates and tracking across the sky</li></ul>	
<u>AFF 9</u> 4,000 feet	<ul style="list-style-type: none"><li>• An orientation jump to experience getting out of a plane closer to the ground</li></ul>	
<u>Solo jumps</u> 14,000 feet	<ul style="list-style-type: none"><li>• After successfully completing stage 6, you can <u>jump by yourself</u> to consolidate your flying skills</li></ul>	

If you are still unsure as to how to go about getting your licence, just ask one of your instructors, and they will be happy to help explain it to you.