PARACHUTIST INFORMATION MANUAL

C.S.P.A.
Canadian Sport Parachuting Assoc.
Assoc. Canadienne de Parachutisme Sportif
A.C.P.S.

PIM 2B
RECREATIONAL SKYDIVING SKILLS

KNOWLEDGE DISPELS FEAR

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FOREWARD

This 2016 version of PIM 2B is an update to the 1994 version. Now in an electronic format, it can be updated in a timelier manner, along with change tracking, co-authoring, and distribution on the web. Please, send in your suggestions, updates, new ideas, and technical advancements that will help keep all of our manuals on the cutting edge. Submission of graphics is welcomed. This is a living document; it will only grow with your input.

This document is intended for electronic reading in PDF/online format. Click on resource links located throughout the document for additional information. Please, print only if necessary.

If you have questions, suggestions, corrections or additional material relevant to this or any CSPA manual, please forward them to **cwc@cspa.ca** so that your ideas can be considered.

The Canadian Sport Parachuting Association (CSPA) provides these following sections of our manuals to our Members and Registered Participants to ensure that standards and proven methods of training and skydiving are being followed across Canada. The sport of parachuting continues to grow around the world, and as the sport enlarges, so does our knowledge of the technical and training complexities. As new ideas and systems introduced to our sport are proven sound, they are adopted by the CSPA and new information is distributed. To ensure that the best available techniques are being utilised, it is your responsibility to keep abreast of them by participating in Coaching and Instructor programmes and seminars offered by both local organizations and the CSPA.

Although extensive, this manual will not answer all the questions regarding our sport. It is to be used as a guide only, and in conjunction with the CSPA coaching programme and CSPA qualified coaches and instructors. To guarantee the most enjoyment, remember to always...

THINK SAFETY **JUMP SAFELY** **STAY CURRENT**

Skydiving questions not answered in this manual, or in other CSPA publications, may be directed to CSPA's Coaching Working Committee **cwc@cspa.ca** or the National Office **office@cspa.ca**.

ABOUT THIS MANUAL

The purpose of this part of the manual is to provide the novice skydiver with relevant information in preparation for study for the B-Certificate of Proficiency (B-CoP) exam, hence the name "Part B – Recreational". It follows the **PIM2A-Basic Skydiving Skills**; PIM 2 Part B also contains relevant information for the C-CoP; **PIM 2 Part C - Advanced Skydiving Skills** deals with more advanced topics.

The manual is laid out in the typical skydive format of preparation, equipment, in-flight, freefall, and canopy control. Technical knowledge and information for endorsements is associated with the appropriate skill section. This manual has been created as an interactive electronic document, with hyperlinks throughout denoted in **Bold Underlined Text**.

ACKNOWLEDGEMENTS

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Martin Ettinger – Material on visiting parachutists.
Serge Dufour – The original French translation, graphics, and formatting.
Karen Dianna Cox – For some figures and graphics.

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1.1 INTRODUCTION

The material in this manual begins where PIM 2A-Basic Skydiving Skills left off. This manual will provide a progression programme for the novice skydiver. It is divided into the following sections: preparation, equipment, in-flight, freefall, and canopy skills. It starts following the A- CoP (Certificate of Proficiency) on the CSPA Skills Grid. The role of coaching is emphasised and novices are encouraged to find a CSPA Coach 2 to help them through the stages described in this manual. A Coach 2 has the qualifications and experience necessary to aid you in progressing through the Recreational Skills Grid for your CoP.

You should master the skills found in PIM 2A-Basic Skydiving Skills prior to attempting the skills found in this manual. Completion of the Basic Skills Grid to the Solo CoP is the minimum requirements for progressing to the first stage in the Recreational Grid.

All the material needed for the A-CoP and B-CoP Exam is contained in this manual. Prior to writing the exams, read and learn the appropriate sections in PIM 1, PIM 2A, and PIM 2B. Once you have obtained your B-CoP and have successfully progressed through the stages outlined in this manual, the doors to Formation Skydiving (FS), style, accuracy, Canopy Formation Skydiving (CFS), Artistic Events (AE) (freeflying/freestyle), wingsuit, and Canopy Piloting are open to you. Enjoy your sport, but remember to take the time to learn the skills in this manual properly as they will be with you for the rest of your skydiving career. Read on and have fun!

1.2 SKILL ACQUISITION MODEL AND SKILLS GRID

In PIM 2A-Basic, you were introduced to the Skydiving Model, a graphic that is used to group and define the various skills of the sport. You should refer to the CSPA Skills Grid (Alternate) (see the Training Aids section) as a summary to help with your progression.

The grid is divided into the same five areas (or phases) plus technical information:


PREPARATION SKILLS


EQUIPMENT SKILLS


IN-FLIGHT SKILLS


FREEFALL SKILLS


CANOPY CONTROL SKILLS


TECHNICAL KNOWLEDGE

1.3 RECREATIONAL PROGRESSION STAGES

The skill information in this section of the manual is all within the recreational level, as appropriate for the novice to the intermediate jumper. The information required to perform the task is presented and the key points are emphasised. There will be repetition of tasks as you progress through the manual to insure a high level of competency is attained. Once the fundamentals of a task have been mastered, you must refine the details of the skill and improve the quality of your performance. Skills presented later in the progression will generally require that you have achieved some competence with the preceding skills. Work with the Coaches on your dropzone to help develop and refine your skills.

The technical knowledge is also identified in this section. You should learn the theories and unusual situations associated with various skills as you gain experience. Included are subjects such as why certain actions have a certain result and the recommended procedures when facing unusual circumstances in the aircraft, in the air or while preparing for a jump.

Click on the links below for the most up-to-date information from the CSPA Website:

RESOURCES:
CSPA | CWC RESOURCES | TRAINING AIDS | RECREATIONAL SKILLS GRID

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PREVIOUS: SECTION 1 | Overview
NEXT: SECTION 3 | Recreational Equipment Skills

2.1 INTRODUCTION

This section deals with activities performed that will contribute to the quality and success of the jump. There are two types of preparation skills:

- Physical preparation, and
- Mental preparation.

Physical preparation includes stretching, warming up, and "dirt diving", which is rehearsing the manoeuvres you are going to perform in the sky, on the ground. Mental preparation includes learning to relaxation techniques, visualization, mental rehearsal and developing concentration and anticipation skills.

2.2 WARM-UPS AND STRETCHING

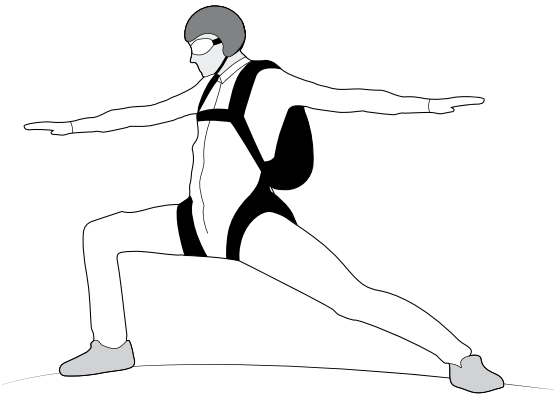
WARM-UPS ARE NECESSARY TO:

- Enhance Performance
- Improve Flexibility
- Reduce Chance of Injury

During progression to self-supervision or solo certification, you learned how to warm up and stretch your body prior to making a jump. Warming up is particularly important as you get older. You should review the routine that you are using to ensure that you are stretching properly to help reduce the chance of injury and improve your performance. Add a few additional stretches to your programme and learn some alternative exercises from the ones you are currently using. A variety of activity will help to maintain interest in warming-up before jumping. If you would like more information on this topic, there are some articles and books about stretching which can be purchased or obtained through the Coaching Association of Canada.

The major points are:

- Begin with a light activity like slow jogging or skipping.
- Start stretching the extremities and work to the centre, working joint-to-joint along each limb.
- Apply a continuous load and hold for 15 to 30 seconds, longer for larger muscle groups (never bounce).
- Work through a full range of motions for each joint: e.g. wrist curls, rotate arms at shoulders in both directions, rotate the neck in both directions.
- Keep body warm to improve the stretches, wear clothing which allows full range of motion and promotes warmth.
- Warm-up first, then perform strength or power activities.



MAKE WARMING UP A HABIT EVERY DAY AND BEFORE EACH JUMP.

▶ 2.2.1 FITNESS

There are three components to personal fitness. The first is endurance, measured as anaerobic and aerobic capacity. The second is strength, measured through activities such as pushing weights, doing push-ups, sit-ups, and chin-ups. The third component is flexibility, measured through your ability to bend, to touch your toes, to twist or tilt your torso, and a variety of other exercises.

What significance do these measures have for skydiving? What amount of endurance is needed, when gravity does all the work? What strength or flexibility is required when the freefall position is flat in the air, pushing against just air? The following information may help you answer these and similar questions.

ENDURANCE: consider the energy requirements for a 16-hour day of work in the sunshine and carrying loads of 20–200 lbs. What about the drain of spending time at dry altitudes in excess of 10,000' above sea level, attempting to work at peak performance while the amount of oxygen in the blood is at a below normal level? Endurance is important, not for the momentary loads, but for the accumulated load of the day or weekend of skydiving.

STRENGTH, particularly upper body strength (shoulders and arms) is required for various Formation Skydiving (FS) type linked exits and for canopy control when performing riser turns, spirals, and making a landing approach requiring the holding of brakes for extended periods of time. Strength in the arms is an aid when packing your rig, especially if the canopy is somewhat of a tight fit going into the container. Strength in the arms can be developed through exercises such as push-ups and chin-ups. Weight training with free weights and the use of weight machines can add considerably to a strength development programme.

FLEXIBILITY is needed if you wish to extend your range of freefall positions. With training, a more curved position is possible, with the benefit of increased falling speed. As you become more flexible, you will find that getting into the exit positions becomes easier. Riding in the aircraft during the climb to altitude will not be as uncomfortable, nor will you be as stiff after a day of skydiving. A regular warm-up and stretching programme is the key for improvement of flexibility.

In order to perform well on every jump, it is necessary to be fit. Fitness becomes more important with age.

THE OLDER YOU ARE, THE MORE REGULARLY YOU NEED TO **EXERCISE**!

2.3 DIVE PLANNING

The critical factors in designing the tasks for a jump are your ability to assess the difficulty of each manoeuvre, the overall jump, and the skill level of the other skydivers. In looking at the skill of dive planning, the objective is to provide you with some criteria that you can use to assess your level of skydiving proficiency.

A few keys to assessing the difficulty of each formation or freestyle manoeuvre are:

- The number of solo manoeuvres or FS formations affects the difficulty: 6 different formations are much more difficult than remembering and performing 2 or 3 formations.

- As the number of people involved increases so does the difficulty: a two way (involving two people moving synchronously) is more difficult than solo; 4 way FS increases the difficulty because all four people have to be moving synchronously in order to be on the same level and within proximity at the same time.

- The number of people in motion (e.g. turning or sliding): Solo movement is easy as compared to pair flying (e.g. Blocks or piece-flying) which is more difficult. Viewing the centre of the formation makes it easier to build: does everyone have a clear view? Is anyone turning blind? Blind turns or outward-facing moves makes it more difficult to maintain level and proximity with the rest of the group. The shape of the formation has an effect: a symmetrical formation (e.g. star or diamond) is easier than a linear (e.g. cat), which is easier than a 3 & 1 (e.g. T).

2.3.1 CONSIDERATIONS FOR A 1-ON-1

- Who will control the fall rate and levels (e.g. the most experienced person? The fastest faller?)
- Select an appropriate set of tasks (e.g. 90°/180° turns)
- Different ways of gripping, based upon ability and position in the formation
- Fall rate matching: weights and jumpsuits
- Type of jump: belly, freefly, CFS
- Specific moves (e.g. turn types, FS blocks) may require ground teaching
- Use creepers for realism for all belly work
- Give everyone time after the practice for quiet mental rehearsal
- Plan and rehearse the exits; in larger aircraft, keep low, back straight and tight with everyone at the door. See §4.12 In-Flight Technical Knowledge

2.3.2 CONSIDERATIONS FOR SMALL GROUPS

- Who is coaching or leading the group?
- Number of different formations
- Number of people involved

- Number of people in motion at any one time
- View to the centre
- Shape of the formation
- How hard is it to remember?
- Ability of the people – consider the individual ability of those with lower time jumpers
- Keep everyone motivated so those with 1000 jumps get to do some challenging moves
- Jump suit colours may be different on the back than the front, as well as gripper colours
- Safety concerns

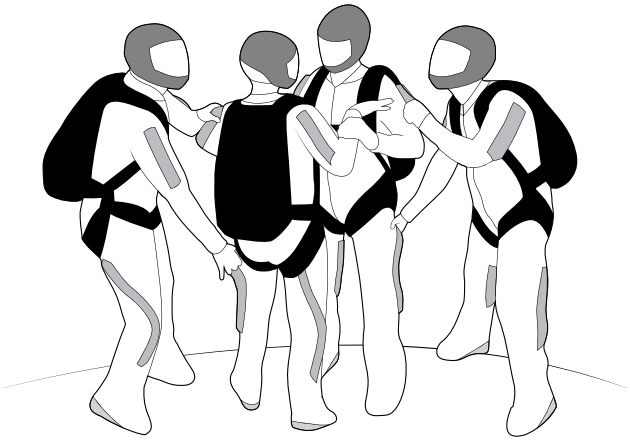


Figure 1: Planning the Dive

2.4 DIRT DIVING

Formation Skydivers call their preparation "dirt diving". This is the physical rehearsal before the jump. Your performance in the dirt dive often reflects your performance in the air. It is important that dirt diving be completed in a way to resemble the actual skydive. This is the time to work out the details, not in the plane.

▶ 2.4.1 BASIC DIRT DIVING FOR 2 PEOPLE: 1-ON-1 SEQUENCE

- Select tasks (formations and skills) to be performed, remain standing and memorise general moves to be performed.
- Define body movements (knee turn or centre turn) to achieve task. Including eye contact, keys and signals, complete the sequence, including all of the fine points.
- Creeper dive or lie down to form the best pictures for final rehearsal.
- Take a short break allowing for individual dirt dives, mental rehearsal and a chance to get a solid hold of all points that have been presented; then repeat the dirt dive together on creepers, practising keys & signals.

EXAMPLE: 90 DEGREE LEG DOCK (CENTRE TURN)

1. Select the tasks to be performed. Right hand set up, no contact 90° turn, knee into hand, key. Left hand set up, no contact 90° turn, knee into hand, key. Repeat. Once you clearly understand what is expected then memorization is necessary.

2. Remain standing while you go through the basic moves. Continue this exercise until there is no hesitation as to what to do or where to go. Develop anticipation.

3. Once the general memorization has been completed, introduce any extra information needed. Points like the distance of the set-up, centre turning, watching the knee enter the hand of the catcher, turning smoothly and accurately rather than quickly, checking altitude, and maintaining eye contact with the catcher until the key has been given and continue through to the next set up.

4. Go to the "creepers" and dirt dive the entire sequence in detail. Remember, be alert, and watch to see if you are dirt diving the tasks properly. The dirt dive must be 100% correct. Provide each other with constructive feedback.

5. Leave and go on your own for a few minutes to perform additional "mental rehearsals". Test your memorization upon regrouping.

▶ 2.4.2 RECREATIONAL DIRT DIVING: E.G. 4-WAY FS

- The same general process occurs as 1:1 Basic
- Differences due to levels of experience
- Use suggestions described in Dive Planning

1. PUZZLE
2. MEMORIZATION
3. FINE POINTS
4. INDIVIDUAL PRACTICE
5. FINAL REHEARSAL

PUZZLE

In the initial stages of dirt diving, while developing the best method, it is important that skydivers cooperate to explore different combinations and possibilities. To do this, some basic principles are used. Sometimes the shortest way is not the best – we often go the long way around to establish better eye contact or flow and avoid a blind or awkward move that could result in lost time even though it may have been shorter. It is important for skydivers to appreciate this initial phase of the dirt dive as an exercise in development, and not focus on any particular sequence until it is finalised. This is one case where the first time through is not likely to be the final version. Do not get fixated on it. Conduct this step first while allowing the skydivers to remain standing. There is no need to wear anyone out at this stage.

MEMORIZATION

Now that the group has decided on a sequence, begin a general memorization of the sequence while still standing. Walk through the sequence until everyone can perform it without any mistakes. There should be no confusion as to where to go prior to continuing. This stage will allow the group to relate to their positioning within the points as well as establish their turn directions.

FINE POINTS

Now that the group has the basic pattern memorised, add the finer points such as heading angles, base set-ups or face offs, waves or staging the building of the formation, eye contact, communication links and keys, as well as describing how to perform any new skills to the group or individuals. This is the time to add realism to the dirt dive.

INDIVIDUAL PRACTICE

Develop the real picture, both the individual role as well as the big picture. Move in rhythm of real time as you expect it to occur in the air. Picture it in your mind with the dive working perfectly.

FINAL REHEARSAL

When completing the final dirt dives, get fully geared up, including helmets. Have everyone study the colours of the rigs and jumpsuits from the back. It is important now that the big picture and the flow be obvious to you. Many things will be inaccurate in the ground simulation, but the one thing that you can practise faithfully is where your eyes are looking. Dirt dive realistically, use “creepers” or even lay it down on the ground in the final stages. Repeat the sequence until the dirt dive flows naturally and accurately. You must know where to go, look for cues to signal your next move and know what you are going to do next. Learn to anticipate what you will see. Take your time, and take breaks when necessary. Finish with a dirt dive that performs the complete sequence expected plus two formations, free of errors, and demonstrates expected performance as realistically as possible. (Consider the strain on the back when dirt diving; take rest breaks periodically.)

▶ 2.4.3 DIVE PLANNING REVIEW

By now, you will be getting into planning dives that are more complicated and it will be useful to review dive planning as described above and then ask the following question of your new dive. Looking at the dive in an overall sense, consider the number of different things being attempted.

- How many moves are difficult to execute (i.e. actions or formations that require a high skill level to complete them)?
- How much effort is required to remember the dive?
- How many points in total are planned before the sequence repeats?
- Is the jump significantly longer/larger than what you have accomplished as a group before?
- How many times does each individual move in or off centre?
- How many different shapes or axes are included?

If you answered "several", "most", or "yes" to two or more questions, then you should reassess the jump tasks. In review, the key points are:

- The mental effort required to remember the dive
- The physical difficulty of flying each point
- The continuity, or lack of it, within the dive activities
- The number of people moving for each point
- The total number of points within the sequence
- The total number of people on the jump.

Remember to keep your dives realistic and try to plan dives that will match the skills of the people with the complexity of the manoeuvres.

INFORMATION CHECK:
WHAT IS THE DIFFERENCE BETWEEN DIVE PLANNING AND DIRT DIVING?

▶ 2.4.4 ADVANCED DIRT DIVING: **PAKS**

The above system is used for beginning formation skydivers to get a knowledge of basic and recreational dirt diving. Once you are comfortable with the steps involved in that system, a more advanced system can be used. This system is defined as PAKS. Apply PAKS to all skydives!

PUZZLE
ANGLES
KEYS
SECRET STUFF

P » PUZZLE

As described above. Creating the mental image of where you need to be in each formation. Walk through the dive sequence to build familiarity.

- Start with a picture/diagram of the skydive; can use a white board or moveable figures.
- Walk through the formation so everyone understands their role in the jump.
- Do this until everyone can get through the sequence.
- Be willing to change.
- Should easily return to the top of the page.

A » ANGLES

Determine the exact body position and angle, and how to split distances moved with the teammates. This is best done on creepers.

- Use creepers or lay down on the ground.
- Be much more specific about orientation in space—shift headings to minimise movements. Take this seriously, make the move and stop, pick up the grips.

K » KEYS

Determine the best person for break point and the chain of command for communication to the centre.

- Who will key? Where will they look or what will they feel?
- On a C2 jump the coach should key.
- Everyone is in charge of altitude awareness; keep aware throughout the dive.

S » SECRET STUFF

Tips on the characteristics of a move.

- Turns—type of turn.
- Eye contact—where to look.
- Grips—who will present/who will catch.
- Set-ups—is there a base, or a sequence to the build/star before donut.
- Cheats—Does not have to be square.

▶ USE OF CREEPERS

Creepers provide a free, realistic way to practise freefall manoeuvres. The novice, coach, and teams should use creepers regularly. Creepers help to create a visual image of the skydive formation, aid in memorizing formations, and aid in producing muscle memory. Use a coach or FS expert who knows the proper technique for "creeping" in order to maximise your experience.

- It is a training aid—it is only as useful as you make it, and it requires practice
- Move and stop—then pick up the grip
- Very important for practising as they help to give the correct visuals
- Do not overuse as it's tiring on your back
- Avoid wearing sunglasses or a tinted visor—you need to be able to see your partner
- Careful with your fingers on the floor—gloves are recommended
- If you are going to rotate pieces you will have to practise how to do it (arm over)
- Make sure to "box out" formations: set arms to 90° between each manoeuvre
- Mark a cross on the floor for angles and quadrants
- Perform the last practice on creepers
- Repetitive back-and-forth between 2 formations will help (example of chaining—practising the link in isolation)
- Do it at least once with the eyes closed
- Finish the practice in a 3X rotation + 1 move (e.g. 5 points if 4 formations)

RESOURCES:
MAKE IT HAPPEN – SPORT PARACHUTIST'S SAFETY JOURNAL – SKYDIVE.
AVAILABLE AT: **MAKEITHAPPEN.COM/SPSJ/MAKEIT.HTM**

2.5 MENTAL SKILLS

Mental preparation is about training the mind to work with the body, rather than against it. For optimal performance, the key is to have a balance between skills and techniques, physical conditioning, mental and emotional control, and tactical knowledge. Each athlete has his or her Ideal Performance State (IPS) – the state in which an individual is completely prepared and poised for perfect performance. This area is vast and this is only an introductory to the exploration of this topic.

In the CSPA Skills Grid, the first section is called Preparation. This unit is important because it deals with mental preparation skills, including emotional stress and mental focus control. Acquiring these skills will certainly enhance the performance of recreational skydivers. A lot of the information found in this section came from the Coaching Association of Canada's former Multi-Sport Module B.[7]

▶ 2.5.1 STRESS CONTROL

By its very nature, skydiving is a stressful activity. In this section, we will discuss the development of skills that can be used to control anxiety, such as controlled breathing, mind-to-body and body-to-mind relaxation, and visualization.

STRESS IS DEFINED AS "A SUBSTANTIAL IMBALANCE BETWEEN DEMAND [PHYSICAL AND/OR PSYCHOLOGICAL] AND RESPONSE CAPABILITY, UNDER CONDITIONS WHERE FAILURE TO MEET THAT DEMAND HAS IMPORTANT CONSEQUENCES" **(MCGRATH, 1970, P.20)**.

The first point to recognise when considering stress control is this: "The stress is not in the situation but how a person perceives the situation".[8] There is an optimal level of "good" stress that will compliment or heighten the quality or level of performance. When the level of "bad" stress is too high, or too low, then the quality of the performance suffers.

Stress produces a burst of energy that directs you on what to do. In small doses, stress has many advantages. For instance, stress can help you meet challenges and motivates you to reach your goals. Stress can help you accomplish tasks more efficiently. It can even boost memory.

Stress is also a vital warning system, producing the "fight-or-flight-or-freeze" responses. When the brain perceives some kind of stress, it starts flooding the body with chemicals like epinephrine, norepinephrine, and cortisol. This creates a variety of reactions such as an increase in blood pressure, breathing, and heart rate. In addition, the senses suddenly have a laser-like focus so you can avoid physically stressful situations—such as jumping out of a perfectly good airplane—and yet still are safe.

In addition, there are various health benefits with a little bit of stress. Researchers believe that some stress can help to fortify the immune system. For instance, stress can improve how your heart works and protect your body from infection.

7 Module B is no longer offered by CAC. Newer programmes available at www.coach.ca and www.coach.ca/multi-sport-s15501. Sport-specific training provided within CSPA Coach 1 and Coach 2 courses.

8 Source Unknown

Stress is key for survival, however too much stress can be detrimental. It may be difficult to know when you are experiencing good or bad stress, but there are ways that your body lets you know that you are struggling with too much stress. Watch out for the following warning signs:

- Inability to concentrate or complete tasks
- Body aches
- Headaches
- Irritability
- Changes in appetite
- More angry or anxious than usual

Stress, and our reaction to it, is twofold, both positive and negative: On one hand, negative anxiety is often found in skydivers who dwell on things that are beyond their control, and/or who do not feel prepared for the jump.

Stress can also be linked to the fear of what others might think of the athlete if he/she does not perform well, especially under evaluation situations (performance anxiety). Some skydivers, however, when exposed to stress, experience more heightened awareness rather than becoming overly anxious. The stress they experience is actually a benefit to their performance.

It is important to remember that anxiety states are normal, and that every athlete experiences both positive anxiety (excitement) and negative anxiety (worry).

Each athlete should seek to identify and understand his or her specific causes of anxiety and the resultant consequences for performance. They should learn coping responses that will help them to manage their anxiety in order to maximise performance.

Some examples of methods used to control stress are:

- Relaxation techniques
- Mental preparation (rehearsal & practice)
- Concentration on what is occurring, rather than what might or did go wrong.

Relax! Often, coaches and instructors overuse this simple command without giving their athlete the means of how to promote relaxation. Just telling someone to "relax" can sometimes have the opposite effect. While it is impossible to eliminate all negative stress from your life, you can control the way you react to stress. Your body's natural "fight-or-flight-or-freeze"[9] response can take

9 http://en.wikipedia.org/wiki/Flight_or_fight_response

its toll. When you are faced with a stressful situation that your mind perceives as a threat, it sends various chemicals, like adrenaline and cortisol, throughout your body. As a result, heart rate and breathing speeds up and your digestion slows down. This tires out the body more quickly. Relaxation techniques help in calming you down, boosting mood and in fighting illness. Try a variety of techniques—like yoga, breathing exercises, meditation, and visualization, cutting out caffeine and smoking (both major contributors to added physical stress)—to see what works for you.

To recap, stress will always be a part of our skydiving skill development and performance. Controlling stress helps make it possible to have a positive skydive. We must identify stress, face it head on, and understand that we can choose it to be a benefit to our performance.

RESOURCES:
COACHING ASSOCIATION OF CANADA, AVAILABLE AT: **COACH.CA**
TIPS FOR MANAGING STRESS, AVAILABLE AT:
WEBMD.COM/BALANCE/GUIDE/TIPS-TO-CONTROL-STRESS

▶ 2.5.2 MANAGING ANXIETY THROUGH RELAXATION TECHNIQUES

Having the mind and body working in full coordination you can be relaxed and only then can you perform to your best.[10] "The better you become at focusing and relaxing, the better your performance and your life will become".[11]

There are several relaxation techniques, but you will have to select the one that is best suited to your personal requirements. Some of the relaxation techniques that you can choose are:

- Progressive muscle relaxation
- Use of key relaxation words
- Centering; self-reflection
- Meditation
- Controlled breathing

10 In Pursuit of Excellence, page 102, Terry Orlick, Coaching Association of Canada, Ottawa, 1980.
11 In Pursuit of Excellence: How to Win in Sport and Life Through Mental Training, 4th ed., page 72, Terry Orlick, PhD., Human Kinetics, 2008.

These techniques are from the Coaching Association of Canada theory manuals. The key points to note are:

- Relaxation is best learned and practised in a quiet, low stress situation.
- It can be applied in more stressful situations, once the technique has been acquired.
- Practise the relaxation technique between jumps, while waiting for the loads to be called, and during the climb to altitude.
- Practise progressive muscle relaxation at home or in a quiet location away from jumping activities, until some degree of skill has been acquired.
- Once you can use the techniques in a controlled situation, begin using the techniques during the jump day, and just prior to exit.

CONTROLLED BREATHING EXERCISE: KINAESTHETIC

1. Close your eyes. Relax your shoulders.
2. Feel your stomach move out; your chest and shoulders should be kept steady, not move.
3. Slowly inhale through your stomach, feeling the increase of air in your chest (about 3 seconds).
4. Hold your breath (only a few seconds).
5. Slowly exhale, feeling a release in tension as your stomach relaxes (about 6 seconds).

Now shift to listening to your breathing.

CONTROLLED BREATHING EXERCISE: AUDIO

1. Close your eyes.
2. Hear yourself slowly inhale and exhale air as you breathe.
3. Slowly inhale.
4. Hear the air pass through your mouth and nose.
5. Slowly release the air.
6. Hear the sound of air passing through your nose and mouth.

You can then begin to focus on all cues (both kinaesthetic and auditory). In other words, focus and relaxation skills are mutually dependent.

RESOURCES:
FOR MORE INFORMATION, THE **COACH 2 REFERENCE MANUAL** HAS A LARGE SECTION ON OTHER RELAXATION TECHNIQUES.

▶ 2.5.3 MENTAL PRACTICE

The dirt dive is the physical practice. It should closely simulate what you are going to do during the skydive. (More about this in 2.4.4 Advanced Dirt Diving: PAKS above). Equally important is mental practice that will reinforce your physical review. Mental practice is your final preparation against "brain lock".[12]

Every skydiver has experienced that sinking feeling in freefall when the other jumpers are staring expectantly at him or her and they have absolutely no idea what they are supposed to do next. Perhaps it has happened on a solo jump during a manoeuvre series when suddenly you have no idea what you had planned to do next. These examples are of the dreaded "brain lock": a time in freefall when your concentration has lapsed and you cannot remember what it was you planned to do. Although you thought that you were adequately prepared, something in your practice was not enough to carry you through the jump completely as planned.

Freefall time is precious. Although the "brain lock" phenomenon is common to us all, it is not something that we want to happen often. We have responsibility to both ourselves and to the other jumpers not to be the cause of wasting precious freefall time.

Mental practice is the key to avoiding "brain lock". As with any memory task or concentration effort, some simple techniques, and standard practices can help make the job easier and more reliable. Skydivers should learn to use these procedures and apply them on every jump. A little discipline and thoroughness in preparation will easily reduce "brain lock" problems.

Good preparation is the key to good skydiving. Some easy techniques for avoiding "brain lock" are:

- Get the big picture
- Become fluent with the terminology of skydiving
- Look for the rhythm and flow in the sequence of formations and manoeuvres
- Do a realistic dirt dive to learn your moves, especially for your eyes

12 "Brain lock" describes a moment where a person is unable to think or process information. This phenomenon is also called a "brain freeze," the idea that the brain is temporarily frozen or locked in place, and therefore unable to perform any functions.

- Before the jump, do a mental rehearsal of the proper jump sequence and the correct execution of your role
- Use mental practice on the way to altitude

RESOURCES:
HOW TO MINIMIZE AND DEAL WITH BRAIN LOCKS? AVAILABLE AT:
COLLEGESKYDIVING.COM/FORUM/VIEWTOPIC.PHP?T=300

It is important that you perform mental practice after instruction to reinforce the lesson. This is also true when you have decided on the actual methods during the dirt dive. Sometimes jumpers will take a break after the design phase so that each jumper can think about their role in the final version. There is also time to use mental practice after the dirt diving is completed and before the jump, e.g. while you are gearing up, and especially on the climb to altitude in the plane.

Mental practice is the ability to rehearse the skydive. Imagine the events, as they will happen, one after the other. The mental rehearsal can be done in the same manner as the dirt dive. The sequence of tasks can be reviewed by using key words for the actions to be performed. These key words should be flashes of the big picture of what is about to be performed. Then imagine the exact physical actions as the events take place. Do this reviewing in as much detail as can be imagined. Fine points like the direction to look, what to grip, which color to follow or dock on, and the keys should all be reviewed. Think, "When this happens, I will do this…"

Always focus on the correct execution. Carry a positive approach and avoid thinking of possible errors or miscues. One of the biggest obstacles to curing "brain lock" is negative thoughts and worrying about "brain locking" (a self-perpetuating dilemma). As you concentrate, visualise your job on the skydive going as planned and feel yourself doing it. It helps to add the physical actions of keys, grips, head directions, etc., when mentally rehearsing.

The final mental rehearsal should occur in the plane while climbing to altitude. This activity should be done at consistent altitudes (e.g. at 4000' close your eyes and perform a mental rehearsal; at 8000' do a verbal review with your coach) and performed on every jump, just as regularly as a final handles check. It is best to close your eyes during your mental rehearsal to aid visualization. It is also worth noting that mental preparation is very useful for the canopy control portion of your skydive. Canopy work can be rehearsed in your mind just as well as freefall work.

▶ 2.5.4 MEMORIZATION

Memorization is the skill of committing the set of freestyle or FS actions planned for to memory. Experienced skydivers will tell you to concentrate on the "Big Picture" rather than just your own actions. To do this you need to be fluent in the vocabulary of skydiving. If you do not know the difference between a zipper, snowflake, spock, or vertical compressed, then it is difficult for you to remember your position. All FS and freestyle jumpers should take time to study the various formations and get familiar with their names.

You should be fluent enough with the vocabulary that you know what to do if someone tells you to make a particular formation, to dock in a stairstep, caterpillar, or compressed accordion. It is not enough for you to see your skydive as taking this grip or that. You should be able to recognise and name the formations and manoeuvres you are attempting. A good way to learn to be fluent is to log your jumps accurately, using the names. This kind of hands on repetition teaches you to master the language. In addition you should look for any flow or sequence in the planned dive as this helps one remember the whole jump, not just understand formations.

Mental skills are a very important consideration on each skydive, and are very important to each component of the Skydive Skills Grid. Performing a high level of mental preparation, being able to mitigate high stress while in flight, visualizing your entire jump prior to exit, and having a clear understanding of your role in the skydive from exit to landing, are all skills tthat will greatly enhance your progression in the sport.

2.6 SELF-DIRECTED DEVELOPMENT

Once past self-supervision or Solo, skydivers should take an increasing responsibility for the development or improvement of their own skydiving skills. The chart below shows how responsibility changes with skill development. The coach gradually relinquishes responsibility and the athlete accepts more responsibility until they are self-directed. It never reaches 100% because there should always be interaction between a coach and an athlete throughout the athlete's skydiving career.

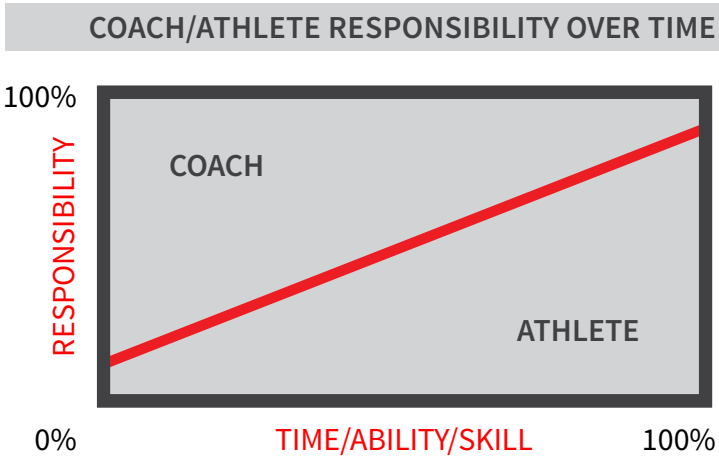


Figure 2: Coaching Responsibility

You should have a clear understanding of your current level of skill development and the skills you wish to attain. The process of skill development requires you to:

A—Identify those things that you can perform at the present;

B—Identify those things which you would like to be able to do; and

C—Identify a few steps or stages that will help you achieve your goals. A post dive discussion will be a great benefit in learning what you did correctly and what could be improved upon.

Key points are:

- Identify your current skills for each of 5 phases of the jump (preparation, equipment, in- flight, freefall, canopy), plus learning technical information.
- Develop personal goals for skydiving activities (i.e. Freestyle, FS, Accuracy, CFS, etc. and recreation or competition activities).
- Set steps to achieve goals, overall in general, first few in detail.

SELF–DIRECTED LEARNING

STAGE	SKYDIVER	INSTRUCTOR/COACH	EXAMPLES
Stage 1: Student	Dependant	FJC Instructor, IAD/SL/PFF Instructor	Instructing with immediate feedback. Information class. Overcoming mental resistance, physical preparation.
Stage 2: Novice	Interested	Instructor → Coach 1	Inspired, guided discussion, assisted learning. Goal setting by Instructor/Coach. Learning Strategies. Seminars. Self-Studying.
Stage 3: Novice	Involved	Coach 2, Skydiving School Examiner	Discussion facilitated by Coach 2 who participates as more of an equal. Seminars. Self-studying. Self-goal setting.
Stage 4	Self-Directed	Coach 2, Skydiving School Examiner, Course Facilitator	Assisting. Advanced skills training with Coach 2. Becoming a Coach.

Figure 3: Self-Directed Learning

2.6.1 GOAL SETTING

It is important to have future goals. Goal setting gives you a sense of direction, purpose, personal satisfaction with success, accomplishment, interest, energy, motivation, and control. Without goals, one can become dismayed with any activity because of the feeling of floundering around or never accomplishing anything. This is why some people just quit the sport one day for no apparent reason. Make goals to challenge yourself, but also be realistic and achievable.

Many people stop skydiving within 5 years. Why do you think this is?

HAVING GOALS IS IMPORTANT, NOT JUST IN SKYDIVING, BUT IN EVERYDAY LIFE!

There are two types of goals: specific or short-term, and overall or long-term. Long-term goals are things such as making 100 jumps in a season, earning your next CoP or rating, or participating in the provincial competitions this year. They may also relate to the philosophy of why you are involved in parachuting.

To identify your overall goals, follow these three steps:

1. Identify your present level of skill (Where am I now?)
2. Identify the long-range goal (What do I want to achieve? When?)
3. Identify the next two or 3 specific goals necessary to move toward the overall goal (How do I get there?)

SMART GOALS

Short-term goals should be **SMART**. That is, Specific, Measurable, Achievable, Relevant, and Timely goals that can be realised in the immediate future. They are performance goals such as completing a smooth dock on a 2-way. State SMART Goals objectively (not subjectively).

To set a specific goal, follow this simple 3- step process:

1. State and describe the performance or task: what do you want to do?

GOAL SETTING

S → SPECIFIC
M → MEASURABLE
A → ATTAINABLE
R → RELEVANT
T → TIME BOUND

Figure 4: SMART Goals

2. State the conditions of performance

3. State the criteria to pass for the jump/day

EXAMPLE: I want to do smooth docks on my coach in subterminal and terminal, remaining in my quadrant, 3 times on one dive.

EXAMPLE: I want to do a turn in place on my coach in terminal, remaining in the box and staying relative, 4 times on 1 dive.

Get together with a coach and talk about your goals. Take control of your direction in the sport. Coming to the DZ and knowing what you want to achieve is a powerful tool. Leaving the DZ every weekend with everything accomplished is a great feeling!

RESOURCES:

SPORTS AND PERSONAL DEVELOPMENT, AVAILABLE AT:
ESSENTIALLIFESKILLS.NET/SPORTS.HTML

POLICING THE EDGE: RISK AND SOCIAL CONTROL IN SKYDIVING, AVAILABLE AT:
ULETH.CA/DSPACE/BITSTREAM/HANDLE/10133/3143/DB%20- %20POLICING%20THE%20EDGE.PDF?SEQUENCE=1

THE "100-JUMP-WONDER" EFFECT

The term is used to denote a skydiver who thinks that they "know it all", and who stops listening to their instructor or coach. It can affect anyone between 50 jumps to well over 1000 jumps, and is a dangerous stage. It can affect all skydivers at some point (yes, everyone goes through this phase). Some individuals learn to respect their coaches and pass quickly through this dangerous phase; others are slower to mature and take longer to get past (200, 300, 1000 jumps, etc.). Left untreated, the 100-jump-wonders will injures themselves because they thought they knew more than they actually did, and refused to listen to coaching. **Any injury reflects poorly on the sport.**

RESOURCES:

10 THINGS THAT MAY KEEP YOU ALIVE, AVAILABLE AT:
DROPZONE.COM/SAFETY/GENERAL_SAFETY/TEN_THINGS_THAT_MAY_KEEP_YOU_ALIVE_81.HTML

ARE YOU A "100-JUMP-WONDER"?

A good check to perform on yourself: If you answer "yes" to any of the following, you might be a 100-jump-wonder.

✓ Do you have less than 500 jumps?

✓ Do you think you have learned all there is to learn?

✓ Have you ever scoffed when a coach tried to tell you something (because you knew it all)?

✓ Have you been told that your actions are risky, even dangerous?

✓ Have you been told, repeatedly, that your actions are dangerous, and yet continue to do the same thing?

HOW TO HELP A "100-JUMP-WONDER"

- Talk to the person. Ask them why they did something. Do not judge, ask. There might be a reasonable explanation…the first time.
- Use as a coaching opportunity to educate, and let the person know you are concerned.
- Avoid the use of ridicule or sarcasm; this only makes people more defensive.
- Let the individual know you care, are concerned for their safety, and that executing moves beyond their skill level WILL get them or someone else injured or killed.
- Just because they see someone with 2000 jumps perform, for example, a high-speed canopy manoeuvre, does not mean that someone with 50 jumps can do it. It takes hundreds of jumps, years of practice, and proper coaching.

MYTHS

"That was easy, give me a smaller one."

"You can't swoop a larger canopy."

"That canopy is too big for me."

"To stop looking like a student, go faster, dive steeper..."

TRUTH

Get trained and become skilled first. Then consider a different canopy after discussing with a coach.

RESOURCES:

RECORD OF SKYDIVING FATALITIES, AVAILABLE AT:
DROPZONE.COM/FATALITIES

SECTION 3 | Recreational Equipment Skills

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PREVIOUS: SECTION 2 | Preparation Skills: Mental and Physical
NEXT: SECTION 4 | Recreational In-Flight Skills

3.1 INTRODUCTION

In this section, you will look at those skills involved in preparing and using parachute equipment within normal jumping activities. The skills are presented in the order in which they are usually learned.

3.2 PACKING WITH INSPECTION

Here we review the equipment inspection process and the canopy packing technique. The following is a combined list of the steps for the whole process. You will use this packing method throughout your skydiving career.

The best sources of information for this activity are the manufacturer's instructions for both the canopy and the rig, as well as a rigger. Key points to remember are to be:

- Systematic, and
- Efficient.

This means that the steps are done in a routine and always in the same order so that nothing is missed. Each activity is done only once; it is completed properly when it is done. An example of a packing procedure (side/factory pack) was described in PIM 2A (§3.8). Following is a list of items to inspect as you pack your canopy. If you incorporate these checks into your packing procedures, you will identify problems before they become potential malfunctions.

- Check the container for marks, burns or stains, inspect the main container fabric, grommets and closing loop
- Watch for stress marks (e.g. the bridle attachment point on the apex of the canopy), or pulled seams while flaking the canopy
- Check the stabilizers and slider stops while stacking the canopy
- Go to the harness
- Check for and remove excessive line twists in the steering lines to avoid tension knots
- Watch the lines for pulls and thin spots as you move to the canopy
- Inspect the steering line attachment points as you pleat the tail
- Check the bridle attachment point and grommet in the D-bag
- Close the bag, replace worn elastics, and check for burns
- Check the pilot chute for wear, inspect the bridle, pin and bag-stop
- Inspect the Velcro for wear or pulled stitching
- Inspect the 3-ring assembly

3.3 COMPONENT IDENTIFICATION

Identify the following list of the components on your rig. If you do not know what these components are, ask a coach or rigger.

main pilot chute	main activation device
bridle cord and pin	deployment bag
main pin	bridle attachment points
stabilizer	nose
tail	bottom skin
top skin	ribs
cell divider	canopy line attachment point suspension lines (ABCD)
cascades	connector links
risers	steering lines
steering toggles	brake setting
3 rings/release system	packing tabs
cutaway handle	reserve handle
main lift web	AAD
reserve static line	lateral adjusters
leg straps	chest strap
main pack tray	main flaps
reserve cable	reserve cable housing reserve pin/s
reserve seal	reserve pack tray reserve flap
cutaway cables	cutaway cable housings

Figure 5: Equipment Components

3.4 DEPLOYMENT CONTROL TECHNIQUES

Controlling the time it takes for a canopy to inflate is the key element in the deployment control process. One can either increase or decrease the amount of time required for canopy inflation. This makes openings softer or harder, respectively. The following are some possible methods for either decreasing or increasing the canopy inflation time. Check with a rigger if you find this information ambiguous.

INCREASING THE INFLATION TIME (slowing down your opening): If you are experiencing too hard or too rapid openings, there are several ways to slow the opening rate, e.g.:

- Roll the first 3 or 4 cells inwards toward the centre cell and stuff the rolled cells inside the centre cell, do the same with the opposite side.
- Use a slightly larger slider or a non-vented one if yours is vented.

DECREASING THE INFLATION TIME (speeding up your opening): If your canopy takes too long to open, or is not inflating properly, there are a few common and effective ways to make it open more quickly; here are some of them:

- Fold the nose only to the A-line (upward/inside) or for more effect, fold the nose under the A-line (outside) before stacking the canopy.
- Check the pilot chute for wear and replace if necessary.
- Use a slightly smaller slider or put a small vent in the centre of the slider.

Prior to undertaking major changes to the canopy such as replacing components, it is advisable to consult with the canopy's manufacturer. If this is not possible, contact a Rigger B (Master Rigger), particularly one who is familiar with that specific brand of canopy. Do not experiment by yourself because what works with one type of canopy may not work properly with another brand of canopy. Deployment is the point in time when the canopy receives the highest level of loading on the entire jump, therefore a change in the canopy's deployment configuration could exceed the load specifications of the parachute. A torn or blown main canopy is an expensive lesson in deployment control. Consult your rigger or the canopy manufacturer prior to changing equipment or methods to something different from that of the factory's recommendations.

3.5 VARIATIONS TO PACKING TECHNIQUES

The manufacturer's recommended packing technique is the best starting point for parachute equipment. Changes to the packing technique may be learned to control the canopy's deployment or to achieve a better fit for the container system. Note that the container system manufacturer's instructions take precedence over those of the canopy manufacturer in packing the canopy for a particular rig.

A degree of caution is necessary when changing packing techniques. Adopting a different technique is not recommended just because someone says it has always worked for him or her. The choice of a packing method should be made on the basis of proven reliability, as well as minimizing the loading to the equipment and the skydiver. The techniques you adopt should minimise the possibility of

needing to use your reserve.

3.6 ACCESSORY EQUIPMENT

Plan to get good quality and reliable products when purchasing accessories. Accessories included here are altimeters, audible altimeters, automatic activation devices, footwear, gloves, goggles, helmet, knife, earplugs, etc.

ALTIMETERS

Altimeters are reliable precision instruments that act as an aid in determining altitude; however, they are not to be exclusively relied upon. It is recommended to get one that has larger numbers on an easy to read contrasting faceplate (i.e.: black numbers on a white face). Smaller dial faces can be used when you gain experience and further awareness. Other factors to consider are where you intend to mount the altimeter (e.g. hand, wrist, chest etc.), and what you intend to use it for (e.g. night jump, Formation Skydiving, CFS, etc.). The BSRs (**Basic Safety Rules: PIM 1**) require the use of a functional instrument (altimeter) on all jumps with freefall longer than 10 seconds. Mount the altimeter in a fashion that is readily visible, but that eliminates drag (e.g. a possible vacuum), and is not a snag hazard. A wrist-mount altimeter should not interfere with grips; it is recommended by some Canopy Formation Skydivers that a wrist-mount altimeter should not be used; a chest mount or rig (riser cover) mounted altimeter would be a good choice.

AUDIBLE ALTIMETERS

These are highly recommended if you intend to do formation skydiving. Before getting one, you should consider how you intend to use it and how it is to be mounted in your helmet. Audible altimeters are usually set to beep at break-off for formation skydiving.

AUTOMATIC ACTIVATION DEVICES (AAD)

An Automatic Activation Device is a highly recommended safety device; it is mandatory until you have received an A-CoP. There are several types available for use on the main or reserve parachutes. Parachutists using an AAD must be thoroughly familiar with the operation of the device to avoid the danger of premature activation. Follow manufacturer's recommendations for setting the AAD. An AAD must **never** be used as a "psychological crutch".

FOOTWEAR

Footwear should give adequate protection to the foot and ankle. Running shoes are good for this purpose. If you have weak ankles then high top running shoes or hiking boots may be a good investment. Footwear must not have any hooks or buckles that could snag. Proper footwear is a TSR

(**Technical Safety Recommendation §3.5**), although you will see skydivers wearing sandals or bare feet, they do not really offer a great deal of protection especially on aircraft exits, landings, and obstacle landings.

GLOVES

Gloves are recommended mainly for protection of the hands in aircraft exits and landing, especially with the square gliding/skimming canopies. They may be needed to protect hands from the cold; however, they must not be so bulky as to interfere with the operation of the equipment, especially the main and emergency handles. They must not have any snaps, hooks or buckles attached that could snag on to anything. Even in warm tropical climates gloves save the hands for an unplanned off DZ landing on unprepared landing areas.

GOGGLES

Wear goggles on all jumps for protection against eyes drying out, cold and dust particles in the air. When performing Formation Skydiving, clear goggles are preferred for eye contact reasons. Tinted goggles may be an asset in bright light provided they do not interfere with good eye contact. Goggles must not interfere with or restrict peripheral vision. Tinted goggles are a hindrance when performing jumps near dusk. Even a slight amount of tint is magnified when light conditions diminish marginally.

HELMETS

A helmet must provide protection for the head and ears during exits, deployment of the parachute and on landing. Most CSA/AMA approved plastic shell helmets are excellent for parachutists. After suitable experience and consistency in the correct stand-up landing technique, a leather helmet is perfectly acceptable. Leather helmets also provide protection to the ears from the force of freefall air that can damage hearing over time.

HOOK KNIFE

A knife is a useful item (considered as backup equipment) and could be very important in an emergency (e.g., a line over on a reserve). If doing CFS, a hook knife is highly recommended. The hook knife is a popular type and the safest to carry. It should be mounted in a readily accessible location (central body is recommended). Several types are on the market and it is best to talk to the experienced jumpers or CFS jumpers on your DZ for a recommendation. Using a hook knife for day-to-day use is not recommended, as it may be dull before you are called upon to use it in an emergency.

EAR PLUGS

It is rare to see someone wearing earplugs, but think about how much excessive noise your ears are subjected to by the roar of the aircraft every jump. Earplugs are recommended for the protection of your hearing. Extended time at high decibels can damage hearing over many jumps: **en.wikipedia.org/wiki/Hearing_damage#Noise**. Wear earplugs when approaching a running plane and during the aircraft ascent, but removed for the freefall to allow for pressure equalization.

RESOURCES:
"PLANE AND PILOT MAGAZINE" DISCUSSES EAR NOISE DAMAGE FROM A C-182, AVAILABLE AT: **TINYURL.COM/KVAMTWK**

3.7 JUMPSUIT SELECTION

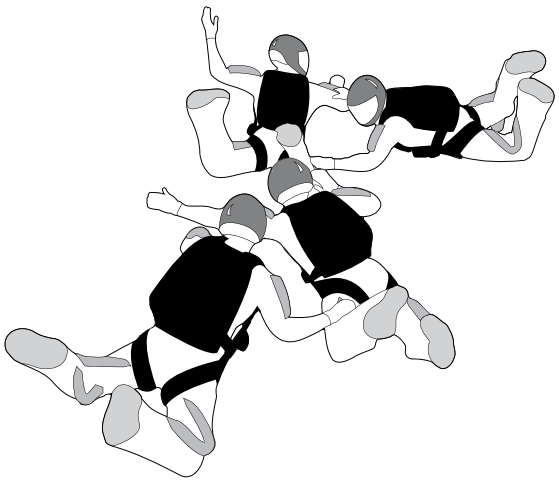
Once you have progressed to a certain level you will probably want to purchase a jumpsuit. A good jumpsuit will aid in control, but should not restrict normal movement or interfere with emergency procedures. A coach may be asked for advice as to what type of jumpsuit to buy. However, the first factor to consider is what type of jumping do you intend to pursue: Style and Accuracy, Freeflying, Formation Skydiving, or Canopy Formation Skydiving.

▶ 3.7.1 TYPES OF SUITS

By its very nature, skydiving is a stressful activity. In this section, we will discuss the development of time as you expect it to occur in the air. Picture it in your mind with the dive working perfectly.

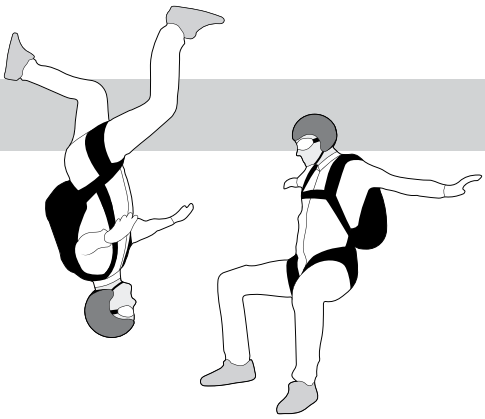
FORMATION SKYDIVING

It is important to have a proper jumpsuit for Formation Skydiving—that is, one with grippers. A jumpsuit is needed to control both fall rate and balance (tilt) while falling. Depending on the type of FS and size of the person, the suit may require different degrees of wing on the arms to speed up or slow down.



STYLE AND ACCURACY

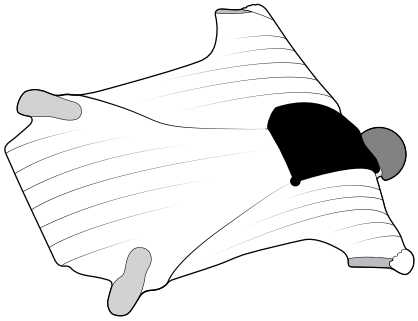
The requirement is to get a suit that is snug, but that also allows total movement. Latex is often used for style series in competition. The suit may also enhance control if it has material such as cotton on the forearms and lower legs. The suit must provide protection from cool temperatures at altitude and from abrasions during landings. The suit should be the correct size, without excess material, extensions, or wing. Often, accuracy jumpers will have either tight material for the lower leg (e.g. spandex) or nothing in order to see the electronic landing pad and no fluttering to distract their approach.



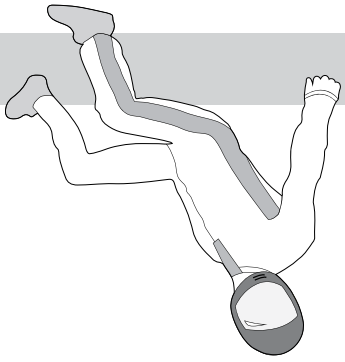
FREEFLY & FREESTYLE SUITS

This suit is tight around the legs and slightly loose on the arms. This style of suit also works well for skysurfing. There is a variety of Freefly suits, including 2-piece with separate pant and jacket or the standard 1-piece full suit.

WINGSUIT



Creates surface area with fabric between the legs and under the arms. It adds surface area to the human body to enable a significant increase in lift.

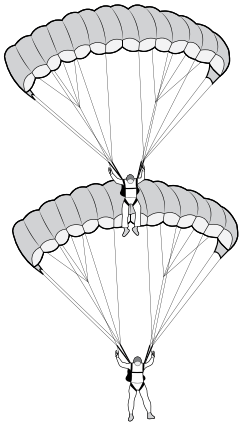


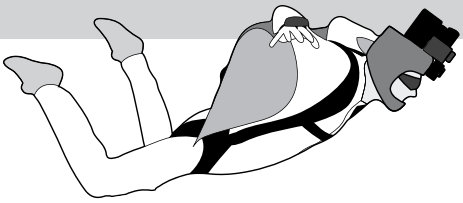
TUNNEL SUIT

This suit has to be very strong and durable for the constant wind pressures in the tunnel; more and more skydivers use tunnel suits to freefly because it can be used in both tunnel and in skydiving. It has a tight fit around the body to avoid any interference in the tunnel or in the sky, and usually drag on the legs and arms to aid in lift.

CANOPY FORMATION SKYDIVING

The only requirements for a CFS suit are: a suit made of a thick enough material to protect oneself from line burns, and a suit that has nothing for lines or canopy to snag on such as grippers. An additional feature is to have hook knife pockets included at accessible locations on the suit.





CAMERA SUIT

These suits (either jacket to be worn on its own or as a full suit) contain wings under the arm to aide in changing fall rate in order to match the person or people being videoed. Some wings are single-sided and some are double-sided (like a sit-suit wing). Improper use/training can result in dangerous openings.

▶ 3.7.2 JUMP SUIT CONSIDERATIONS

FALL RATE

The key to Formation Skydiving is to have matched fall rates (relativity). Since people are not all the same size or weight our fall rate can be quite variable from person to person. A jumpsuit can compensate for our individual differences. Here is a guideline:

- It is a fact that it is easier to learn how to fly the body as opposed to a lot of material and the use of suits and weights is determined after correcting the body position.
- Light jumpers should wear a snug, but comfortable fitting suit. Wings or excess material is not necessary.
- Intermediate jumpers should wear a loose suit with a little cuff or bell at the wrists and ankles with only a little or no wing.
- Heavier jumpers should use a larger suit with whatever wing is needed to maintain relativity. Heavier jumpers are better to start with a little extra material and have a chance of entering rather than always being low.
- Extensions can assist heavier persons and camera persons. However, they may contribute to sliding in the air, and severe hesitations may result if the pilot chute is

trapped within the large "burble" caused by the extensions. Extensions should not incorporate rigid stiffeners.

- "Sleeves" to help slow the fall rate can enhance your jumpsuit without having to modify them. Big way camps use these often to help adjust fall rates.

MATERIAL

The material used in the construction of the jumpsuit can make a difference. These materials are listed in order of most drag to least drag:

1. Cotton [most drag]
2. Poly-cotton blends
3. Nylon
4. Spandex
5. Latex [least drag]

The choice of material will depend on the individual's fall rate, experience level and type of jumping planned.

FREEFALL TILT

Our previously mentioned physical differences not only affect our rates of fall but also can cause tilting while we are falling in a relaxed stance. People's proportions are different between the upper and lower body. The variation in placement of body mass may cause the body to tilt head high or low, resulting in a back slide, or forward dive. The jumpsuit can be tailored to bring the body to a balanced or a flat attitude. You will find flying much easier if you are not fighting to compensate for a built-in slide. Before making any changes, be sure that your body position when relaxed is correct. The correct body position to be in is the "Boxman".

SOME TIPS FOR ADJUSTMENTS

If you are backsliding while in a box position, take in the material along the arms and perhaps some wing if it will not affect your relativity. If there is no material to take from the arms then add some to the legs to increase the drag of the lower body. If you are in a constant forward slide, then take in the material along the legs or add some to the arms. Remember that taking away material is considerably easier than adding material, but it may increase the fall rate.

GRIPPERS

If a skydiver is selecting a jumpsuit for sequential FS, then grippers should be added. Grippers should be firm and solidly attached.

BOOTIES

Wind deflectors from the knee to the toe are known as booties. Although not necessary for recreational FS, they do aid in turns and provide extra forward speed. Booties should be constructed of heavy material; they should resist snagging on the aircraft step as well as not slipping off the foot in freefall.

3.8 USE OF WEIGHTS

Lead, usually worn in a belt, can be used to help very light jumpers be relative with their teammates. There is discussion as to whether weighting is necessary or a person should develop a better body position in freefall. Keep in mind that jumpers participating in recreational skydiving may be of questionable physical fitness. It takes training and a good degree of flexibility to attain a good fast fall box position.

THE USE OF WEIGHT SHOULD BE USED **ONLY** IF NEEDED. THE FIRST THING IS TO CORRECT THE BODY POSITION (FLAT, NEUTRAL, AND RELAXED BOX) BEFORE RESORTING TO USING WEIGHTS.

Being too light can affect arm placement and grip taking. It limits the control range, especially with forward and downward movements. Lastly, do not let yourself get caught up in equipment trends.

If it has been established that you need the use of weights, then you should follow these guidelines:

- Weights can be made from lead shot and for ease of determining the amounts, should be made in equal increments of about one pound.
- The weight pockets should be of easy access to load in case of being in a hurry and easy to unload in case of an unintentional water landing.
- Always wear your weights as little as possible when on the ground.
- Never dirt dive or pack with weights on. Get dressed as late as possible to avoid unnecessary strain on the body. Back, shoulder, hip, knee and ankle pain and fatigue can occur from wearing weights unnecessarily over a long period.

- Wearing the belt should not interfere in any way with the normal operation of your main and emergency handles.
- Weights should be worn on the front of the belt in all cases. If a lot of weight needs to be worn and some needs to go in your container, then make sure the belt weight exceeds the container weight. Added weight raises your centre of gravity within your mass and can affect your stability and solidness in the sky.
- Balance the weight on your vest so that the proper freefall tilt is achieved. This can be achieved by putting more or less weight on the upper or lower parts of the vest. Weights should enhance your neutral position by putting your torso squarely on the relative wind.
- Be aware that wearing weight may slightly affect the performance and landing characteristics of your canopy.
- While using weights, you need to keep certain information in your logbook. Always document:

1. How much weight you jumped with;
2. Who you jumped with and the type of suit they wore; and
3. The effect that occurred, i.e. good, too light, or too heavy. Very quickly, you will be able to make correct decisions about how much weight to wear in all situations.

SUGGESTION: When traveling with your weight belt, take your weights as carry-on, in case you need to explain what they are, avoid putting the weights in your checked baggage.

3.9 ROUTINE MAINTENANCE

This is defined as the maintenance activities that the recreational skydiver must do to keep their equipment in a safe condition for continual skydiving.

Some of the points which you will want to perform, or look out for are:

- Flexing of single point release risers (i.e. 3-ring risers);
- Cleaning and lubrication of cutaway cables (speak with your rigger before attempting; some cleaning products are not recommended);
- Replacement of main closing loop as soon as it shows signs of wear;
- Trimming or shaving of worn pile (loop) Velcro or have it replaced by a Rigger B; replacement of hand tacks;

- Change worn or broken stowing bands (elastics or tube stows); and
- Repack the reserve every 180 days (check with your CSPA Rigger).

Consult with a Rigger on a regular basis for detailed inspection, reserve packing, routine servicing and any questions or problems relating to the gear.

3.10 STORAGE PRACTICES

There are two parts to this topic. The first relates to storing gear during the active jump season, both during the day and mid-week. The second relates to proper storage of gear during the off-season, for long periods when not jumping.

During the jump day, pack your equipment promptly after landing in the shade or indoors if possible, then cover it, or bring it inside, out of the sunshine. Note that exposure to sunlight significantly reduces the strength and life of nylon and other synthetic fabrics. At the end of the day and between jump days, gear should be stored in a heavy fabric equipment bag that is placed in a cool and dry location. Avoid locations where it would be exposed to direct sunshine, fluorescent light, or excessive heat. The car trunk is not a good storage place.

In the off-season, the rig should be stored in a cool, dry place. Be alert to avoid any location near hot water pipes, heating ducts, corrosive fluid or fumes, or places where you might find mice or other rodents.

If your reserve is due for a repack, but you know that you will not be jumping for several months, put the rig on and practise activating the reserve. A pilot chute spring will last longer if it is not compressed all the time. Determine if you are comfortable with the pull force. If not, discuss this with your rigger at the next repack. It is not necessary to open up the reserve or main to air them out unless they are damp. In fact, a reserve is harder to pack if it sits open for a while, and is subject to possible damage.

3.11 EQUIPMENT SEMINAR

An equipment seminar is available through the CSPA and is an excellent source of technical information for every skydiver at any level. It addresses how to select, use and care for sport parachuting equipment. Contact your local CSPA member drop zone or the national office for information on when and where the next one is being held.

3.12 EQUIPMENT TECHNICAL KNOWLEDGE

3.12.1 EQUIPMENT SERVICING

You may own your own parachute equipment. For this reason, you should know when and how to have the equipment properly serviced. Like an automobile, which requires regular tune-ups and oil changes, parachutes, require regular servicing by a Rigger. Here is a list of service requirements, and occasions when you must enlist the services of a rigger.

RESERVE PARACHUTE CANOPY:

- Detailed inspection with assembly at the time of purchase
- Inspection and repacking every 180 days
- Inspection and packing on the occasion of reserve deployment
- Inspection and packing if the canopy is exposed to water or any type of chemical

MAIN PARACHUTE CANOPY:

- Detailed inspection, followed by assembly at the time of purchase
- Inspection on the occasion of a canopy malfunction
- Inspection on the occasion of any deployment problem
- Repair of any damage to the canopy
- Inspection and packing after any period of storage

HARNESS & CONTAINER SYSTEM:

- Detailed inspection with assembly at the time of purchase
- For repair of any abrasions or damage to the harness
- On the occasion of any malfunction of the container system
- Detect any deterioration of stitching, fabric, or hardware

3.12.2 EQUIPMENT CHARACTERISTICS

An understanding of the characteristics of a piece of equipment is important in order to identify differences between two similar, but not identical products. Each piece of parachute equipment has its

own specific characteristics; identified in this section are the main canopy, the reserve, and the harness. In addition, general comments about parachute equipment are presented in the last paragraph.

MAIN CANOPY

The key characteristics of the main canopy are surface area, aspect ratio, control range, volume, flight characteristics, opening speed, opening shock, and reliability.

Note: Since the ram-air canopy has become universally accepted as the main canopy for skydiving in Canada and the United States, only its characteristics are mentioned in this sub-section.

THE SURFACE AREA is a measure of the square footage area of the canopy. It is obtained by multiplying the measurements of span (side to side) and chord (front to back) together (see Figure 6). Canopy area ranges from under 100 sq. ft. to over 400 sq. ft. Dividing the weight of yourself PLUS all of your skydiving equipment by the surface area of the canopy will provide you with your wing loading.

E.G. A 135 LB. PERSON + 20 LB. GEAR = 155 LB./220 FT^2 OF CANOPY = 0.705 LB./FT^2

Every canopy has an optimum load range. Applying too little or too much load may compromise the performance of the canopy.

THE ASPECT RATIO of a canopy is the ratio of span to chord (see Figure 6); the higher the aspect ratio of a canopy, the less drag is produced for a given amount of lift. This results in a more efficient wing for its surface area. A perfectly square canopy would have an aspect ratio of 1:1, while some of the nine-cells on the market today have ratios of 3:1.

THE CONTROL RANGE of a canopy is the physical distance through which the steering loop must be moved to go from full flight to a stalled performance. A canopy with a short chord will have a short control range; a canopy with a longer chord will have a larger control range.

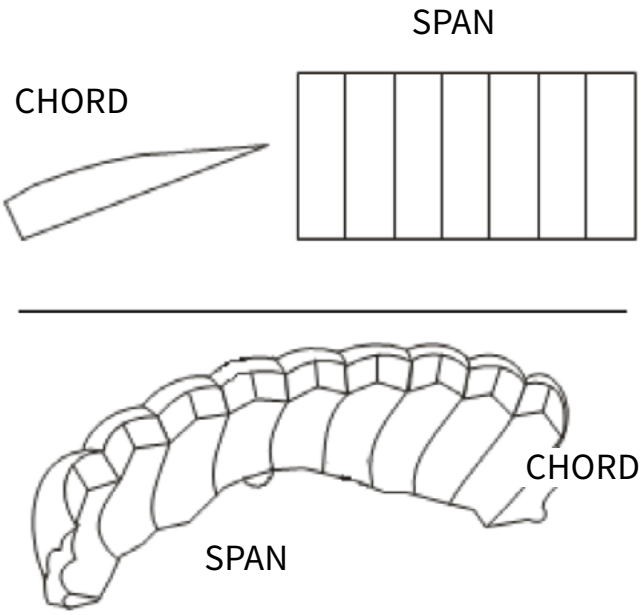


Figure 6: Span and Chord

The control range of a canopy is not affected by shortening or lengthening the steering lines by relocating the position of the steering loops or toggles. Moving the position of the steering toggle does not vary the range but will only effect the height of your hands. For example, if your canopy is at full flight with hands at your head and starts to stall at your stomach (30 inches of range), by lowering the toggle (lengthening the steering line) your canopy will be at full flight at your neck and start to stall lower such as your hips (still 30 inches of range). By raising the toggle (shortening the steering line), your canopy will be at full flight with hands all the way up and start to stall higher such as your breasts (still only 30 inches of range). If adjusting your toggles be sure not to shorten them so much that your canopy cannot reach full flight. The steering lines should have some slack in them.

THE PACK VOLUME of a canopy is a measurement of the volume that it will fill when it is packed and compressed.

- The volume occupied by a packed canopy is affected by temperature, humidity, age of the fabric, and compressive force used in packing.
- A canopy will pack its largest in a cold, dry climate; after it has been in service for some time it will contain some dirt; a greater degree of effort is needed to get a canopy into a smaller bag.
- Most manufacturers measure the volume of their products in a standard set of conditions, using an agreed measurement device and standard amount of compression weights.
- Pack volumes can vary from 225 to greater than 900 cubic inches.

THE FLIGHT CHARACTERISTICS of a canopy are relatively well understood. Three terms of importance are the forward speed, the response time, and stability.

THE FORWARD SPEED is the canopy's airspeed with the steering loops in the full flight position. It is related to the area, aspect ratio, airfoil design trim material, and material drag. The airspeed of a specific canopy is also affected by the load (jumper), which is called "wing loading". The greater the load, the faster the canopy.

THE RESPONSE TIME (TURN RATE) is the time it takes the canopy to respond to a control action (e.g. pulling the right steering loop); it is also affected by the load under the canopy.

STABILITY is related to both surface area and aspect ratio; a larger canopy is more stable, as compared to a lower aspect ratio.

THE OPENING SPEED of a canopy is a measure of the time it takes for the canopy to inflate fully at terminal velocity. In general, a canopy with a small surface area will inflate more quickly than one with a larger surface area.

THE OPENING SHOCK is actually a double shock so close together it feels like one. The first being the effect of the opening canopy slowing you down to its speed, and the second effect of you bringing the canopy up to your speed.

INFLATION TIME is affected by the deployment control methods used, the load (skydiver) and the "age" of the canopy.

RELIABILITY of a canopy is a measure of its deployment reliability or inversely its malfunction potential. With normal packing and deployment techniques, a ram-air canopy should malfunction only once in roughly 5,000 jumps. This is an aggregate figure produced by adding together all the jumps made on each model/brand of canopy, then comparing it to the total number of times that model malfunctioned. This does not mean that you should burn your parachute if it malfunctions twice in twenty jumps, but you might consider doing something about it if you have 10 malfunctions in 500 jumps. You could also consider asking the manufacturer or rigger to check out your packing technique.

RESERVE CANOPY

The first concern for the reserve canopy is its opening reliability. Other concerns include flight characteristics, packed volume, deployment method, and surface area.

RELIABILITY is essentially the same concern as that for the main canopy, except that the reserve is seldom used or tested. The reserve has to work the first time and every time it is needed. Reserve canopies in total have many fewer jumps on them than do many main parachutes. For this reason, many manufacturers produce reserve canopies that are copied from particular models in their lines of main canopies.

FLIGHT CHARACTERISTICS are similar to those considered for the main canopy, including forward speed, rate of descent, stability, and response time. In general, round reserves have less forward speed, a higher rate of descent and are slower to turn than ram air reserves.

PACK VOLUME for the reserve is the volume of space into which the canopy can be compressed using normal packing methods and without an excessive amount of force. A measure of the canopy's volume is provided by the manufacturer, based on an assessment in standardised conditions.

PACKING AND DEPLOYMENT METHOD considers the type of control, if any, which is present to stage and/or slow the deployment and rate of inflation of the reserve canopy. You should not purchase a canopy with a device that you do not like, as opposed to changing or removing it when the canopy arrives. Alterations other than those authorised by the manufacturer must not be performed on reserve parachutes.

SURFACE AREA for a ram-air reserve is measured in the same way as was the ram-air main, span multiplied by chord. A round reserve is identified by a measure called nominal diameter, which is the distance measured along a radial seam, from lower lateral band to lower lateral band, crossing over the apex of the canopy. This measure can be approximately converted into a surface area figure if necessary using the formula it r^2, where "r" is half the nominal diameter.

THE "RIG" OR HARNESS

The characteristics of the harness and container system include the following: main activation method, container volume (main & reserve), main canopy release system, harness size and reserve deployment control.

MAIN ACTIVATION METHOD considers whether the main canopy is activated by a throw-out pilot chute, a pullout, or a ripcord. Each type of activation system has been proven through extensive testing and use within the skydiving community. The most common method by far is the throw-out pilot chute. Select an activation method with which you are familiar. Since no system is foolproof, you are cautioned to be aware of the failure modes for the activation system that you choose. In addition, be aware of the proper procedures for packing and activation of the main. Knowing what can go wrong will contribute to you being able to avoid circumstances that might lead to that failure.

CONTAINER VOLUME (main and reserve) refers to the internal volume of the container compartments, one figure for the main, and another for the reserve container. It is essential to safety in the aircraft and in the air that a canopy fit into the container in which it has been packed. Having a canopy that is either too large or too small for the size of the container is a problem. This information usually appears on the manufacturer's TSO tag. The size of each container is expressed in cubic inches or with a letter code that is explained in the owner's manual. A visual check should be done. You do not want material bulging out the sides of the container or the container so loose the pin is loose.

MAIN CANOPY RELEASE SYSTEM could be one of several types available on the market. As the release system is an integral part of the reserve system and procedures, a note of caution is worthwhile when selecting this item. Select a release that has been tried and proven in actual use by jumpers. Most systems offer a one-point release, that is pulling one handle releases both main canopy attachment points. There are several types on the market. A few rigs provide two individual canopy release mechanisms. The one-point style of release system has been preferred for many years.

HARNESS SIZE is determined when the harness is built. Sizing is normally limited to small, medium, and large, and several companies custom-build harnesses. The harness should fit properly, that is without pulling the adjustments to their minimum or maximum. Incorrect fitting of a harness may result in physical injury during an opening. Over time, incorrect distribution of opening loads due to improper fitting of the harness will contribute to muscle strain and deterioration of joints and ligaments.

RESERVE DEPLOYMENT CONTROL considers the method of containment for the reserve canopy. The rig will have certain features incorporated when it was built. Included are items such as a bridle locking loop, one or two pin closure, floating or fixed closing loop(s), open or restricted corners (or flaps), internal launching plate, internal or external pilot chute, and line stows included (or not). The presence or absence of some of these features will limit the reserve container in terms of compatibility with the available reserve canopies. Not every reserve deployment system will work with any reserve container. The deployment system used (e.g. free bag or diaper) must be matched with the specific container system into which it is being packed. Otherwise, it might go in, but may not come out when it is needed. The **Skyhook**-RSL© (developed by **Uninsured United Parachute Technologies, LLC**) is a device that uses the released main to help in the deployment of the reserve by acting as a supplement to the pilot chute.

GENERAL COMMENTS

There are three areas of concern towards any specific piece of parachute equipment. These concerns are design validity, quality control, and user protection.

DESIGN VALIDITY presents the concern that the piece of equipment has been tested to satisfy the requirements under which it will be used. In testing, it should have shown a functional reliability to a degree approaching 100%.

QUALITY CONTROL presents the concern that the specific item that you obtain has been checked for its adherence to the original design, that quality fabrics and hardware have been used in its construction, and finally that it was inspected at key stages during its construction to assure that it is complete and properly assembled.

USER PROTECTION presents the concern that the manufacturer is obligated to provide certain information and services to the owner (you). You should receive directions for product assembly and use, information about routine inspection and required servicing. The equipment should be marked with a serial number and have a notice enclosed identifying the product's size (e.g. volume). The manufacturer (or distributor) should maintain a record of serial numbers with names and addresses of their equipment owners, in order to be able to deliver service bulletins and servicing information to you later.

▶ 3.12.3 EQUIPMENT SELECTION

For newcomers to the sport who wish to purchase their own equipment or experienced jumpers who are updating their gear, there is an almost unlimited selection available on the market. Since new and used sport equipment varies in price, dependability, and performance, the following guidelines may make your purchase decision easier. Each piece of parachute equipment has its own specific characteristics; these are identified for the main canopy, the reserve, and the harness/container. An understanding of the characteristics of a piece of equipment is important in order to identify the differences between two similar, but not identical products. In addition, general and safety comments about parachute equipment selection are presented in the last paragraphs.

RESOURCES:

"DO SKYDIVERS CARE ABOUT SAFETY?", AVAILABLE AT:
DROPZONE.COM/SAFETY/GEAR_AND_EQUIPMENT/DO_SKYDIVERS_CARE_ABOUT_SAFETY_19.HTML

MAIN CANOPY

The main canopy is selected by a skydiver based on their weight, the type of jumping they are doing (i.e. FS, CFS or S&A), and their skydiving experience. Small area canopies (under 150 sq. ft.) are used by light people & some experienced FS jumpers. Medium sized canopies (i.e. 170 to 240 sq. ft.) are used by averaged sized people and most recreational jumpers. Large area canopies (i.e. over 250 sq. ft.) are used by heavy people, students, and accuracy jumpers. An initial reference point for size of canopy can be calculated by multiplying your weight by 1.5; this should give you an approximate size in square feet for a lower performance canopy. Multiply by 1.0 for a high-performance ram air canopy.

Here are some of the options and size ranges:

- Surface area ranges from under 100 sq. ft. to over 400 sq. ft.
- Packed volume ranges from 200 cu. in. to over 900 cu. in.
- Canopy weight (without risers) ranges from 4 lb. to 15.5 lb.
- Forward speed for most canopies is estimated at 20 to 38 m.p.h.
- Two construction methods are available: spanwise & chordwise.

- Most are rectangular, but some newer canopy designs are elliptical (end cells shorter than centre cells).
- Suspension lines may be cascaded or continuous.
- Cells may or may not be cross-ported.
- Common canopies have 7 or 9 cells.
- Most canopies use slider controlled deployment, a few use a spider.
- Older canopies use a 400 lb. Dacron suspension line; some accuracy canopies use a heavier (525 lb.) line.
- Many newer canopies use Spectra (or "Microline") lines with similar strengths, but much smaller diameter for less drag and bulk.

Before purchasing a main canopy, the following information and options may be listed by the manufacturer. For more detailed explanations of information of which you are unsure, consult a rigger, an instructor, or an experienced skydiver.

span	cross porting	stock number
chord	packing tabs	price
area	glide ratio	recommended weight
weight	recommended pilot chute	model number
fabric	toggle types	type of construction
lines	continuous vs. cascaded lines	lift/drag ratio
line connection	time of 1st 360° turn	suspension line strength
pack volume	time of 2nd 360° turn	parachute opening device
forward speed	custom colour charge	reefing system
maximum suspended weight	shipping weight	CFS modifications
number of cells	canopy name	aspect ratio

Figure 7: Canopy Components

RESERVE CANOPY

The reserve canopy is selected by a skydiver on the basis of his/her size (weight), the packed volume of the canopy and the method of deployment control used; today it is standard to use a square, ram-air canopy. Lightweight and experienced skydivers select the smallest reserve canopy that they feel they can land safely. Those who are heavier and who have less experience select larger canopies. Also, consider how you will be landing if you become unconscious. Square reserves are similar to main canopies with the exception of listing the TSO category (mainly US).

HARNESS & CONTAINER SYSTEM

The rig is selected by a skydiver based on familiarity with the rig, an appreciation of its appearance, fit and comfort, plus availability in the size (volumes) required, along with the chosen methods of main and reserve activation. Some of the choices are:

- Main activation with pull-out, or throw-away, or ripcord;
- Main handle (activation) located on the harness, belly band, leg strap, or corner of the main container, or bottom of container (BOC);
- Reserve pilot chute mounted internal or external (pop-top);
- Cutaway method is single point or two point;
- Reserve activation, including cutaway, requires one or two;
- Harness is split saddle or solid saddle; adjustable or not;
- Legs straps snap or feed through;
- Container when packed is flexible or rigid.

Before purchasing a harness and container, the following information and options may be listed by the manufacturer. Make sure the gear you will purchase has an approved TSO-C23 (**Technical Standard Order (TSO)-C23, Personnel Parachutes Assemblies**).You can also read important **CSPA Technical Bulletins** regarding gear. For more detailed explanations of information of which you are unsure, consult a rigger or an instructor. (See **§3.13 Parachute Downsizing Criterion**).

weight	reserve closing
cutaway system	internal vs. external pilot chute
main pack tray size range	custom charge
reserve pack tray size range	options
square reserve compatible	accessories included (risers, bag, etc.)
fabric	colours
harness size	part number
AAD compatible	name
number of reserve risers	price
deployment method—main	leg strap hardware
deployment location	canopy name

Figure 8: Reserve Components

In addition to learning each of the major characteristics of a piece of equipment, here are some general concerns that you should investigate:

- Manufacturer's reputation for standing behind their products, including service, product information, owner's manual, correction of defective goods, and experience with the particular product line.

- Dealer's support for the product, including servicing, repairs and corrections of defective items, plus instruction for the purchaser/owner.
- Product's reputation in actual service; has it been well received, satisfying its owners during at least one year on the market?

▶ 3.12.4 SAFETY INFORMATION

Before actually using your main canopy, read the manufacturer's instructions thoroughly, read and understand the RAM AIR Information **§6.15 of PIM2A**, and consult with an instructor/coach and/or rigger for clarifications.

If you have to do a system change of the main handle, reserve handle location, and/or reserve procedures, it is highly recommended to see an instructor and to consult the System Changes **§3.11 of PIM 2A**.

There are no specific restrictions on the use of one or another type of main canopy, jumpsuit, or container assembly. However, new equipment should NOT be tried out while participating in Formation Skydiving. This constitutes a needless and thoughtless endangering of others' safety. Several familiarization jumps must be made with "new" equipment prior to using it on a Formation Skydiving jump (see System Changes in **§3.11 PIM 2A**).

Accessory equipment should be of good quality, since the same articles can be used right through your jumping career.

When purchasing gear, consult with a CSPA Rigger, Coach 2, or an Instructor. The person from whom you are buying from may not be the best person to get advice. Even if they are, always get a second or third unbiased opinion.

Never attempt to use or purchase equipment that is beyond your capabilities or your experience level. Check with a CSPA Rigger or Instructor for advice prior to purchase and to obtain the appropriate instruction and endorsement if required.

If you are ever in doubt about the operation characteristics, airworthiness, safety features, etc. of any equipment item, ask a CSPA Rigger, Coach 2, or Instructor.

RESOURCES:
DOWNSIZING CHECKLIST, AVAILABLE AT:
DROPZONE.COM/SAFETY/CANOPY_CONTROL/DOWNSIZING_CHECKLIST_47.HTML

3.13 PARACHUTE DOWNSIZING CRITERION[7]

Jumpers with less than 500 skydives must not downsize beyond this chart. Jumpers are welcome to use a larger parachute than the chart suggests.

### (###)	MIDDLE OF RANGE (SMALLEST ALLOWED)

EXIT WEIGHT (LBS.) JUMPS	110 FT²	121	132	143	154	165	176	187	198	209	220	232	243	254	265
1	190 (170)	190 (170)	190 (170)	190 (170)	190 (170)	190 (170)	210 (178)	210 (189)	230 (200)	230 (211)	230 (222)	260 (230)	260 (230)	260 (230)	260 (230)
20	170 (170)	170 (170)	170 (170)	170 (170)	190 (170)	190 (170)	210 (176)	210 (187)	230 (198)	230 (209)	230 (220)	230 (230)	230 (230)	230 (230)	230 (230)
40	170 (150)	170 (150)	170 (150)	170 (150)	170 (150)	190 (160)	210 (171)	210 (182)	230 (192)	230 (203)	230 (214)	230 (224)	230 (230)	230 (230)	230 (230)
60	170 (150)	170 (150)	170 (150)	170 (150)	170 (150)	190 (156)	190 (166)	210 (177)	210 (187)	230 (198)	230 (208)	230 (218)	230 (229)	230 (230)	230 (230)
80	170 (150)	170 (150)	170 (150)	170 (150)	170 (150)	190 (152)	190 (162)	210 (172)	210 (182)	230 (193)	230 (203)	230 (213)	230 (223)	230 (230)	230 (230)
100	150 (135)	150 (135)	150 (135)	150 (135)	170 (150)	170 (150)	190 (158)	190 (168)	210 (178)	210 (188)	230 (198)	230 (208)	230 (217)	230 (227)	230 (230)
120	150 (135)	150 (135)	150 (135)	150 (135)	150 (135)	170 (145)	190 (154)	190 (164)	210 (174)	210 (183)	220 (193)	230 (203)	230 (212)	230 (222)	230 (230)
140	150 (135)	150 (135)	150 (135)	150 (135)	150 (135)	170 (141)	190 (151)	190 (160)	190 (170)	210 (179)	210 (188)	230 (198)	230 (207)	230 (217)	230 (226)
160	150 (135)	150 (135)	150 (135)	150 (135)	150 (135)	170 (138)	170 (147)	190 (156)	190 (166)	210 (175)	210 (184)	230 (193)	230 (202)	230 (212)	230 (221)
180	150 (135)	150 (135)	150 (135)	150 (135)	150 (135)	150 (135)	170 (144)	190 (153)	190 (162)	210 (171)	210 (180)	210 (189)	230 (198)	230 (207)	230 (216)
200	135 (120)	135 (120)	135 (120)	135 (120)	150 (123)	150 (132)	170 (141)	170 (150)	190 (158)	190 (167)	210 (176)	210 (185)	230 (193)	230 (202)	230 (211)
220	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (129)	170 (138)	170 (146)	190 (155)	190 (163)	210 (172)	210 (181)	210 (189)	230 (198)	230 (207)
240	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (126)	150 (135)	170 (143)	190 (152)	190 (160)	190 (168)	210 (177)	210 (185)	230 (194)	230 (202)

7 The following canopy downsizing chart (with permission from Big Air Sportz) is provided to CSPA Members and Registered Participants to help skydivers make their own decisions about appropriate canopy sizes. Copyright © Big Air Sportz, Inc., Tampa, Florida, USA. www.bigairsportz.com

EXIT WEIGHT (LBS.) JUMPS	110 FT²	121	132	143	154	165	176	187	198	209	220	232	243	254	265
260	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (124)	150 (132)	170 (140)	170 (148)	190 (157)	190 (165)	210 (173)	210 (181)	210 (190)	230 (198)
280	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (121)	150 (129)	170 (137)	170 (145)	190 (154)	190 (162)	190 (170)	210 (178)	210 (186)	230 (194)
300	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (127)	150 (135)	170 (143)	170 (150)	190 (158)	190 (166)	210 (174)	210 (182)	210 (190)
320	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (124)	150 (132)	170 (140)	170 (148)	190 (155)	190 (163)	190 (171)	210 (179)	210 (186)
340	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (122)	150 (129)	150 (137)	170 (145)	170 (152)	190 (160)	190 (168)	190 (175)	210 (183)
360	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (127)	150 (135)	170 (142)	170 (149)	190 (157)	190 (164)	190 (172)	210 (179)
380	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (125)	150 (132)	170 (139)	170 (147)	170 (154)	190 (161)	190 (169)	210 (176)
400	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (122)	150 (130)	150 (137)	170 (144)	170 (151)	190 (158)	190 (166)	190 (173)
420	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (127)	150 (134)	170 (142)	170 (149)	170 (156)	190 (163)	190 (170)
440	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (125)	150 (132)	150 (139)	170 (146)	170 (153)	190 (160)	190 (167)
460	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (123)	150 (130)	150 (137)	170 (143)	170 (150)	190 (157)	190 (164)
480	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (121)	150 (128)	150 (132)	170 (141)	170 (148)	170 (155)	190 (161)
500	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	135 (120)	150 (126)	150 (132)	150 (139)	170 (145)	170 (152)	170 (159)

* Size must be increased as necessary to reflect "Relevant Variables"
* See footnotes and explanations (below)
* The chart is based on "Total Exit Weight": [Jumper + All Equipment]

Figure 9: Downsizing Chart

FOOTNOTES & EXPLANATIONS

The chart gives two different values:

A) Top Number: **Middle of Range** (Not an absolute figure. See "Relevant Variables" below.)

Due to individual differences in natural ability, judgment and demonstrated in-air awareness,

there must be allowances for variability with the recommended size. To fit every canopy pilot into a finite formula is not reflective of the true nature of the situation.

B) Bottom Number: Smallest Size Allowed

Although some canopy pilots are ready to downsize beyond the recommended limitations of this chart, there must be absolute limits. Most parachute manufacturers prescribe a Maximum Wingloading[8] for a given parachute design, implementation of these limitations requires further elaboration. The purpose of the bottom number is to establish a "Wingloading Never Exceed", or **WNE**, defined in Pounds per Square Foot, rather than a wingloading number. This allows for careful selection of each subset category of the wingloading range, reflective of the non-linear nature of parachute performance as it relates to wingloading and canopy size.

APPLICABILITY OF CHART:

The parachute size to which the Chart suggests pertains to the Smallest Parachute of the dual parachute system (main or reserve).

RELEVANT VARIABLES:

Density Altitude Compensation—Surface area should be increased to reflect increases in density altitude. Increase the recommended size by roughly 10 square feet for each increment of 2000 feet above sea level. This adjustment is subject to adaptation based on the proficiency exhibited about the "Essential Manoeuvres" (see below).

Currency—Add approximately 15 square feet for less than 100 jumps per year (i.e. 120 becomes 135). Add approximately 30 square feet for less than 50 jumps per year (i.e. 120 becomes 150).

Canopy Design—Add one size for Fully Elliptical Canopies (FEC). FEC = More than 20% wing taper. Fully Elliptical Canopies are not recommended for jumpers with less than 300 jumps. Prior to transitioning from a non-elliptical to elliptical planform, all jumpers should make at least 100 on a non-elliptical parachute of the same wingloading, or as dictated by the Canopy Transition Course Instructor.

Rounding Sizes—The parachute sizes prescribed by the Chart do not always coincide with the sizes marketed by a given manufacturer. Given this, jumpers should use the size closest to the prescribed number if the number is not a standard size. If the canopy is elliptical or radical in design in some other way, this may or may not suggest increasing the size further. This is a judgment call of the Canopy Transition Course Instructor, and should be based on the skills demonstrated by that canopy pilot. The best course of action is to err on the side of safety.

8 In aerodynamics, wing loading is the loaded weight of the aircraft divided by the area of the wing. In parachuting, it is the combined weight of the jumper + all equipment, divided by the area of the canopy. E.g. (170# jumper + 20# gear) / 170 = 1.1

Rounding Weight—Use the weight and size to the right of your numbers. If your weight is above the number on the chart, round up to the next higher number.

Skipping Sizes and Planform[9] Type—It is not advisable to change planform type and or size simultaneously in the transition process. Skipping sizes or changing planform type is a judgment call of the Canopy Transition Course Instructor based on the skills demonstrated by that canopy pilot, and the best course of action is to err on the side of safety.

Beyond 500 Jumps—After a canopy pilot has exceeded 500 jumps, the only limitation on wingloading, size, and planform is to be based on the Specific Canopy Manufacturer's Recommendations for that design, and of the Safety and Training Advisor or equivalent instructional staff.

Probationary Period—The initial jumps on a new canopy are a probationary period. This is an opportunity for the pilot to focus complete attention on the flight characteristics of the new canopy. Therefore, the first five jumps on a smaller or more agile parachute should be made solo, opening no less than 5000 feet AGL.

Frame of Reference—Depending on the jumper's previous experience, currency, and individual ability, the canopy transition course instructor may choose to allow accelerated downsizing or skipping sizes.

Non-Linear Nature of Parachute Performance—Due to effects relating to the balance of drag between the suspended weight and the parachute, the same canopy design of varied sizes will perform differently with the same wingloading.

Larger wings tend to have more **Roll Axis Stability**, shortened **Recovery Arc** and superior **True Glide Ratio***.

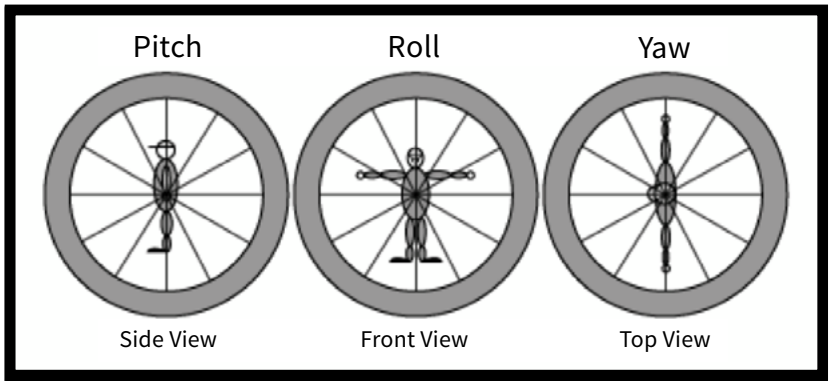


Figure 10: Pitch Roll Yaw

9 In aviation, a planform is the shape and layout of a fixed-wing aircraft's fuselage and wing.

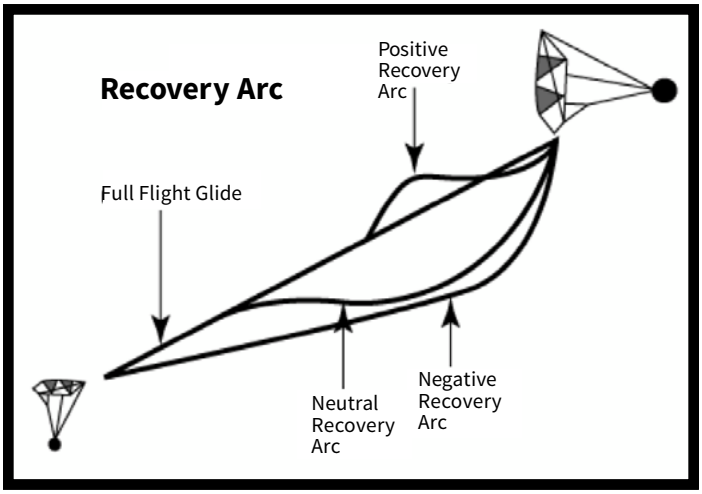


Figure 11: Recovery Arc

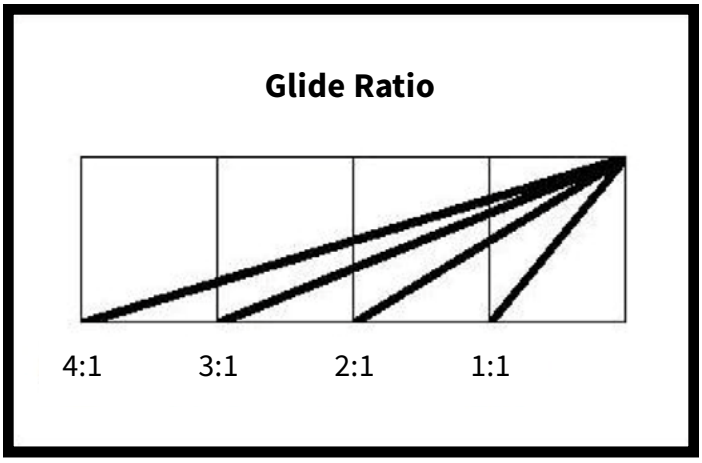


Figure 12: Glide Ratio

While a 170 square foot canopy may perform in a docile manner at 1.0 lbs. per square foot, a 107 of the same design will be much more responsive at the same 1.0 wingloading. Therefore, the Chart skews the data in a non-linear nature, suggesting a more gradual downsizing progression for lighter pilots and a more aggressive paradigm for the heavier jumpers.

Relative Glide Ratio and Wingloading—Although **Upwind Relative Glide Ratio** is further enhanced with increased wingloading, **Downwind Relative Glide** is more a function of descent rate than airspeed. Therefore, the best way to enhance Downwind Relative Glide is in the deep brake mode on a small canopy, or through the use of a larger parachute.

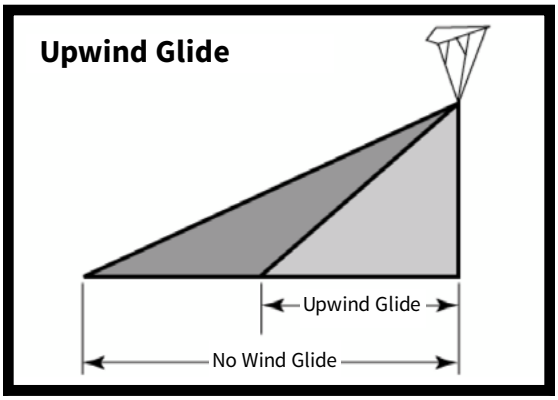


Figure 13: Upwind Glide

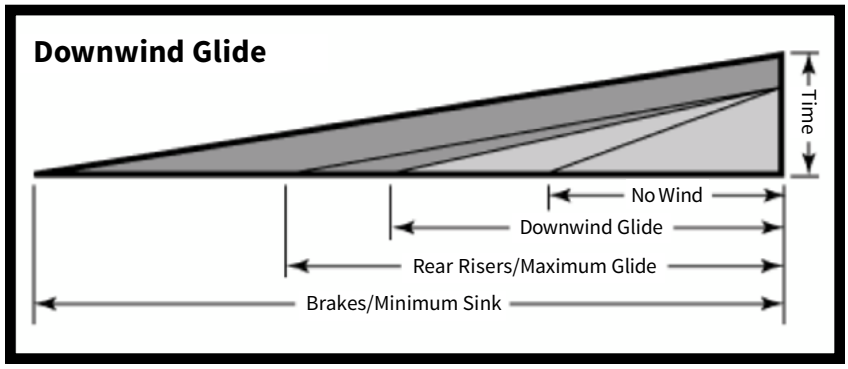


Figure 14: Downwind Glide

Smaller parachutes have several advantages when flying in high wind conditions, as well as in turbulent air. Further, heavily loaded canopies tend to perform more like fixed-wing aircraft, enhancing the extrapolative learning process. Nevertheless, downsizing prior to attaining the necessary skills and judgment is unwise and potentially very dangerous. Therefore, the

following set of performance standards establish a baseline for a canopy pilot as they prepare to downsize. Without demonstrating the following survival skills prior to switching to a smaller canopy, the increased airspeed, descent rate and roll axis are a set-up for failure.

ESSENTIAL MANOEUVRES

The following is a list of in-flight manoeuvres essential to safe flight. These tasks must be performed regularly, so that the pilot will have the ability to perform these manoeuvres without thinking. "Learned Instincts" must be developed for such tasks, so that when situations arise requiring immediate action, the programmed responses will be the correct ones.

- All exercises should be performed above a safe cutaway altitude, in the event that the pilot inadvertently induces line-twists and loses control of the parachute.
- All exercises should be performed on the current size and planform before downsizing or transitioning to a more responsive design.
- All exercises should be performed on dedicated jumps, opening above 5000 feet AGL. Opening high following a Formation Skydiving freefall may allow sufficient time to perform the manoeuvres, but dedicated jumps are preferable as a learning experience.
- Video should be used whenever possible for debriefing and evaluating landings and in-flight manoeuvres.

PITCH CONTROL EXERCISES

- Manipulate the canopy on the pitch axis using the brakes.
- Look at canopy to notice the amount of pitch axis change.
- Notice the amount of slack in the brake system when in the full flight mode.
- Notice the difference between "soft" and "sharp" inputs: {slow application vs. quick}.

WHY?

Controlling the pitch angle is how we manipulate the Angle of Attack[10] of the wing. Without a dynamic change to the angle of attack, the pilot will be unable to increase the lift of the parachute enough to change the direction of flight from its normal full flight glide to level flight. This manoeuvre is therefore essential for safe landings.

10 In aerodynamics, angle of attack specifies the angle between the chord line of the wing of a fixed-wing aircraft and the vector representing the relative motion between the aircraft and the atmosphere. Angle of attack is the angle between the body's reference line and the oncoming flow.

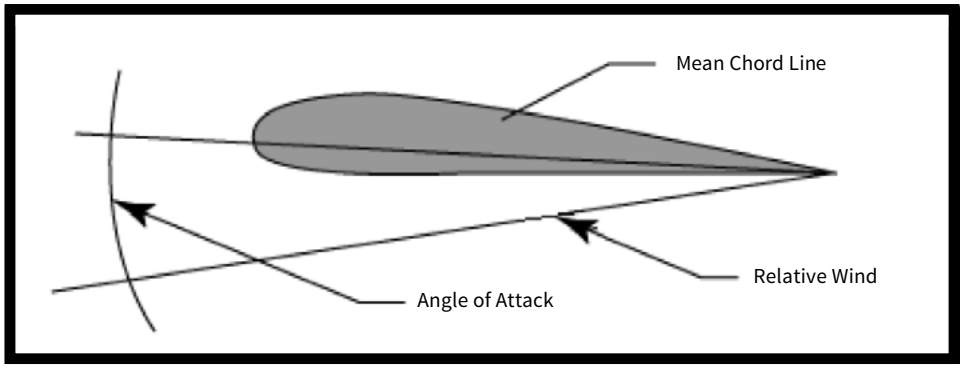
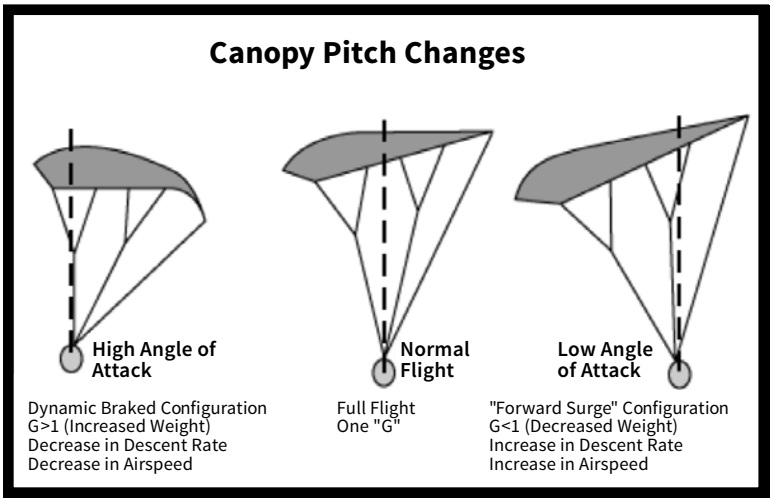


Figure 15: Angle of Attack

STALL PRACTICE

- Find the stall point using both the brakes and the rear risers.
- Recovery with minimal altitude loss and loss of heading.
- Controlled recovery must be demonstrated, using a slight reduction in the angle of attack, rather than an aggressive release, which can result in a collapse of the wing or line-twists.
- Any modern parachute design is capable of stalling and recovering safely with proper technique.



*CG = Centre of Gravity

Figure 16: Stall Point & Recovery

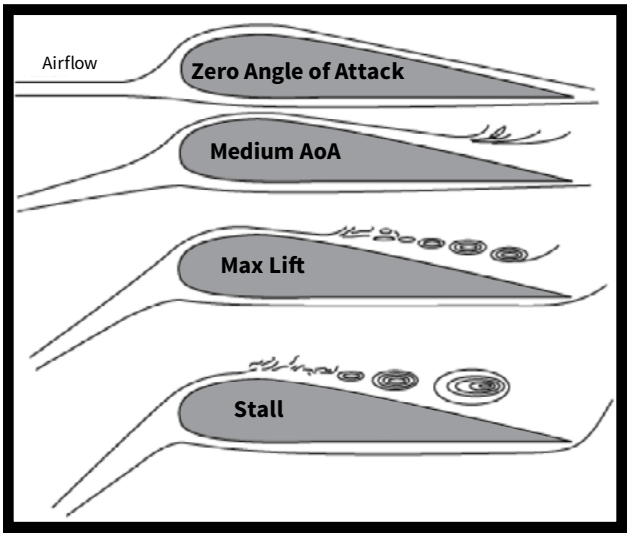


Figure 17: Stall Point

WHY?

The stall point represents the highest angle of attack that a particular wing can utilize prior to a loss of control. This discrete angle of attack, when approached slowly, also represents the slowest airspeed available to the pilot. When landing in no-wind conditions, it is necessary to diminish the airspeed as much as possible in order to achieve the lowest possible groundspeed for the touchdown. On smaller, high airspeed parachutes, this ability is essential.

Further, deep brake flight is often necessary for approaches into small landing areas. If the pilot is unfamiliar with the flight characteristics of the parachute in the high angle of attack mode, there is significant risk of a stall or spin at low altitude. By rehearsing slow flight and beyond to the full stall condition, the pilot becomes more comfortable with dynamics of the canopy in the steep descent flight mode. If the parachute stalls, quick recovery has become a learned instinct, increasing the chances of survival significantly.

SLOW-FLIGHT PRACTICE

- Place the canopy in 90% brakes and hold for 60-90 seconds.
- Make controlled heading changes of 45-90 degrees.
- Notice the difference in responsiveness as compared to full flight turns.
- Notice that lifting a toggle on the outside of the turn reduces the risk of stalling the wing on the inside of the turn.
- Notice the diminished roll axis stability in the deep brake mode, requiring smooth control inputs and slow recovery of the roll angle.

WHY?

Most pilots spend the majority of their canopy ride in full flight. This means that the feeling of the canopy in this mode is most comfortable to most people. It also means that flying in deep brakes places many out of their comfort zone. In other words, most people are somewhat uncomfortable just prior to putting their feet on the ground on every single jump.

Anxiety in slow flight often causes pilots to hold their breath which diminishes their cognitive capacity due to oxygen deprivation. The impatience caused by the discomfort usually results in looking down and offsetting the steering toggles toward the end of the landing in order to get to the ground sooner. They simply want this part to be over.

In order to land with great consistency, we must become intimately aware of the flight performance of our parachutes in very deep brakes. The more time we spend in this flight mode, the more comfortable we will be.

PITCH CONTROL WITH BANK ANGLE

- Begin a turn using a single steering toggle.
- Apply the opposite toggle while still in the turn.
- Experiment with soft versus sharp inputs to negate decent.
- Look at canopy to notice pitch changes with respect to the relative wind.
- Recover bank angle to zero **As Gently As Possible**, as roll axis stability in high angle of attack flight mode increases the likelihood of overcorrection in the recovery of the roll angle.
- Exercise should be practised alone, as well as with a relative reference such as another canopy, altitude reading or clouds.

WHY?

Having the ability to control the pitch axis while in a bank is what gives the pilot the ability to control the descent rate while in a turn. The natural tendency is to lose altitude in a turn, but this is not necessarily the result of turning with bank angle. By increasing the angle of attack while in a bank, the pilot increases the amount of lift that the parachute is producing, and can alter the flight path to zero descent rate flight despite significant bank angle.

The goal of this manoeuvre is to cultivate the ability to arrest the descent rate while in a turn, rather than relying on a reduction in the bank angle to negate descent. This technique can be utilised during low altitude emergency evasive action. It is inevitable that parachutists will encounter situations requiring a change of heading close to the ground. This method allows such actions without significant risk, given sufficient rehearsal.

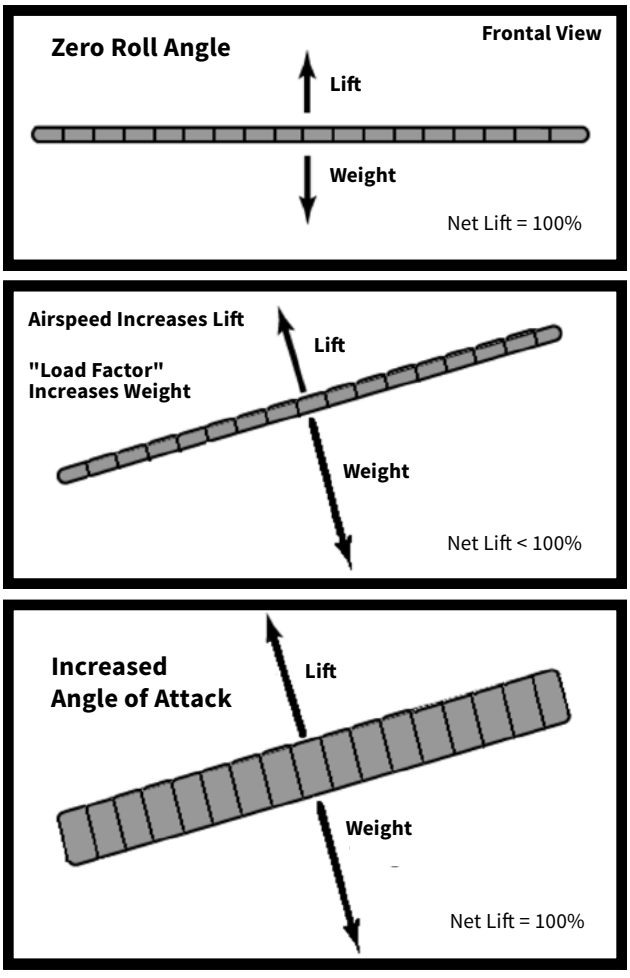


Figure 18: Pitch Control, Bank Angle

DIVE ARREST—TOGGLE TURNS

- Begin manoeuvre above 3000 feet AGL.
- Place the canopy in a spiral dive using a single steering toggle.
- Arrest the dive as quickly as possible by sharply applying the opposite toggle while maintaining toggle input on the inside of the turn.
- Roll out of the turn at a high angle of attack without oscillation or overcorrection.

WHY?

While turning too close to the ground is the preliminary cause of injuries in parachuting, it is not specifically the bank angle that causes the accident; it is the Descent Rate. Although bank angle tends to be coupled with a loss of altitude, it is the low angle of attack that causes the descent. The descent rate of any turn can be eradicated through the application of collective brake pressure in a turn when sufficient airspeed is maintained throughout the manoeuvre.

Unfortunately, most canopy pilots assume that bank angle must be eliminated before arresting the dive. This leads many to waste valuable time and altitude in the process of leveling the roll axis of the system prior to the flare. In situations with very little altitude remaining, this may delay the collective brake application until it is too late. Further, the release of the single brake input allows the canopy to surge forward in the window, causing a decrease in the angle of attack.

By rehearsing a transition to zero decent while still in a bank, the pilot becomes accustomed to applying the toggle on the outside of the turn as a learned instinct, reducing the chances of a turn leading to serious injury. The process of "Carving" out of a turn, rather than allowing the canopy to follow a diving recovery, is perhaps the most important skill available to the modern parachute pilot.

TURN REVERSAL

- "**Pause and Reverse**" (wait for line tension returns prior to reversing direction of flight)
- "**Aggressive Reversal**" (apply collective toggle input prior to reversing direction of flight)

WHY?

It is often necessary to reverse the direction of a turn to avoid traffic. Without sufficient rehearsal, a pilot may inadvertently induce line-twists and lose control of the parachute. By practising turn reversal, the pilot is able to change direction almost instantly, decreasing the risk of canopy collisions.

REAR RISER FLIGHT

- Perform rear riser evasive turns immediately after opening with the brakes stowed.
- Perform rear riser turns with the brakes released.
- Perform rear riser flares and stalls.
- Apply collective rear riser input to flatten glide without a significant loss of airspeed.
- The benefits of such exercises are significantly enhanced by having a relative reference such as clouds or another parachute flying in no contact formation.

WHY?

In the event of traffic after opening, there is little time to alter the canopy's heading, and the process of releasing the brakes requires time. Having the ability to safely manoeuvre the parachute with the brakes stowed is essential to safe parachuting. Experimenting with the performance tendencies of each parachute brings to light individual issues relating to over-steer and allows the pilot to take precise evasive action.

Performing rear riser turns with the brakes released prepares the parachute pilot to properly deal with a broken steering line. Further, by rehearsing rear riser flares, the pilot will be better equipped to handle such situations. Attempting to land a parachute using the rear risers with no prior high altitude rehearsal is unadvisable and may lead to injury.

Lastly, application of collective rear riser input allow the pilot to increase the True Glide of the canopy, reducing the risk of off-field landings, as well as altering the flight path to improve accuracy.

FRONT RISER INPUT

- Perform straight front riser dives.
- Perform single front riser turns.
- Perform offset double-front riser turns.

SPECIAL CONSIDERATIONS:

Front riser input should be applied with the toggles in the hands. Given this, the manoeuvre requires forethought and planning on exactly how to hold and release the risers without risk of inadvertently dropping a toggle. Risk of dropping a toggle near the ground can be significantly reduced by inserting all four ringers into the toggles and tightly grasping the toggle with the pinkie and ring finger at all times. This allows freedom of the index and middle finger for insertion into the front riser dive loops.

Front riser pressure increases as a function of airspeed. Therefore, attempting front riser application in full flight or faster is extremely difficult or impossible. In order to reduce front riser resistance, application and subsequent release of 1⁄4 brakes is usually sufficient to diminish the resistance to within workable limits.

WHY?

Reduction of the angle of attack is necessary for many flight manoeuvres including: upwind penetration (improving relative glide ratio), canopy relative flying, accuracy, as well as high performance approaches.

DIVE ARREST—FRONT RISER DIVE

- Place the canopy in a dive using the front risers.
- Rehearse dropping the front risers and quickly stabbing the brakes.
- Rehearse both straight front riser dive recovery as well as turning dives.

WHY?

What keeps pilots alive is the judgment and skills necessary to save them when they dive too close to the ground. If a pilot rehearses the solutions to the dangers, the likelihood of a dive resulting in serious injury is dramatically reduced.

Dropping the front risers allows the pilot to keep their hands down, ready to stab the brakes aggressively to arrest a dive. A short, sharp, “nudge” on the brakes is usually all that is necessary to place the jumper back under the wing, and to the higher angle of attack that saves their life.

HARNESS TURNS

- Harness turns with the brakes stowed.
- Harness turns in full flight.
- Harness turn follow-through after other inputs.
- Harness turns to adjust the flight path on final approach.

Turning on the harness is accomplished by leaning to one side or the other, and lifting the leg on the outside of the turn. The capacity for the harness to load the canopy on one side is limited by chest strap tightness as well as canopy design and wingloading. Utilizing asymmetric harness input in order to effect a turn is only effective on parachutes of sufficient wingloading and elliptical taper.

Harness input can be used to initiate a turn as well as enhance or extend the heading change of another type of input such as toggle, rear riser, or front riser.

WHY?

Immediately after opening, the harness can be utilised to steer away from traffic or toward the landing area prior to unstowing the toggles. Although the turn is not as fast about the yaw axis as a toggle or rear riser input, the immediate access of this kind of turn makes it a useful technique.

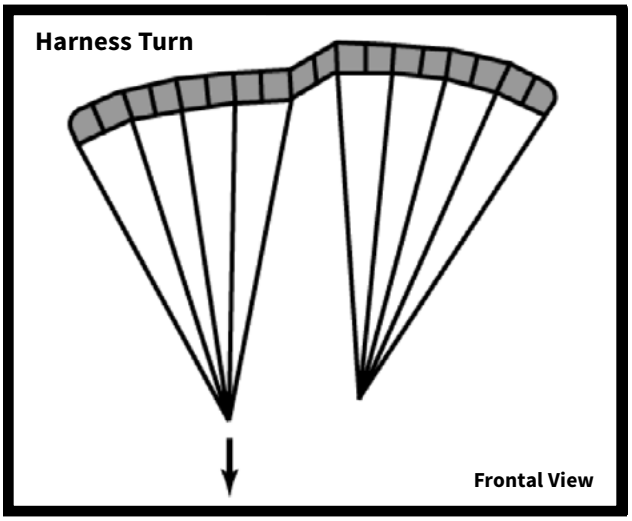


Figure 19: Harness Turn

Another use of the harness turn is for heading changes in turbulent conditions. While all other methods of turning distort the airfoil and alter the pitch axis of the wing (which effects many variables such as airspeed and descent rate), the harness turn is neutral in this regard. This makes the harness turn the safest method in turbulence, reducing the chances of an abrupt decrease in the angle of attack resulting in a loss of control and or collapse.

Harness turns can also be used to enhance or extend the effects of other turning methods. While front riser turns may become difficult as airspeed increases, the heading change may be continued with the harness even after the pilot is forced to let off the front riser input.

On final approach, adjustments to the heading should not affect the glide angle. Unlike toggle inputs, harness turns will not result in pitch and roll axis oscillations. Therefore, harness manoeuvering can be a superior control input to other options.

PRECISION LANDING PATTERN

- Enter the pattern with sufficient altitude for the descent rate and glide ratio of the specific canopy.
- Fly a semi-linear downwind, base and final approach with minimal adjustments so as to coordinate with other traffic in the pattern.
- Demonstrate the ability to appropriately adapt the approach pattern to reflect specific needs of the opening point or other issues that may affect the safety of the flight.
- Demonstrate sufficient situational awareness while in the pattern, not only of location and altitude, but of traffic as well.

Approach technique will vary depending of type of parachute, the pilot's experience level, as well as situational variables. While flying the pattern in full flight may be appropriate for some pilots under certain conditions, others may find more success by flying a braked approach during the Downwind and Base leg of the pattern.

Deep brake approaches can deprive the system of the airspeed necessary for a safe landing, especially on heavily loaded canopies. Final approach, then, should be primarily flown in full glide with only subtle corrections.

*The smaller the canopy, the more altitude is necessary for a safe landing pattern. This is due to the higher descent rate, and increasing the pattern entry altitude allows for a similar amount of time in the pattern for all canopies regardless of size.

WHY?

Consistency in the landing process allows a pilot to notice differences and make necessary changes to the flight path early enough to insure safe landings. Further, by flying a predictable pattern into landing, other traffic will better be able to expect the next change to the flight path, thereby reducing the chance of collisions.

The accuracy method referred to as "S" turns are useful for approach adjustments in the absence of traffic, but create a dangerous situation when multiple parachutes are landing at the same time. Therefore, a standard "Box Pattern" creates a safer situation in the landing area, and is an important skill prior to downsizing or changing planform.

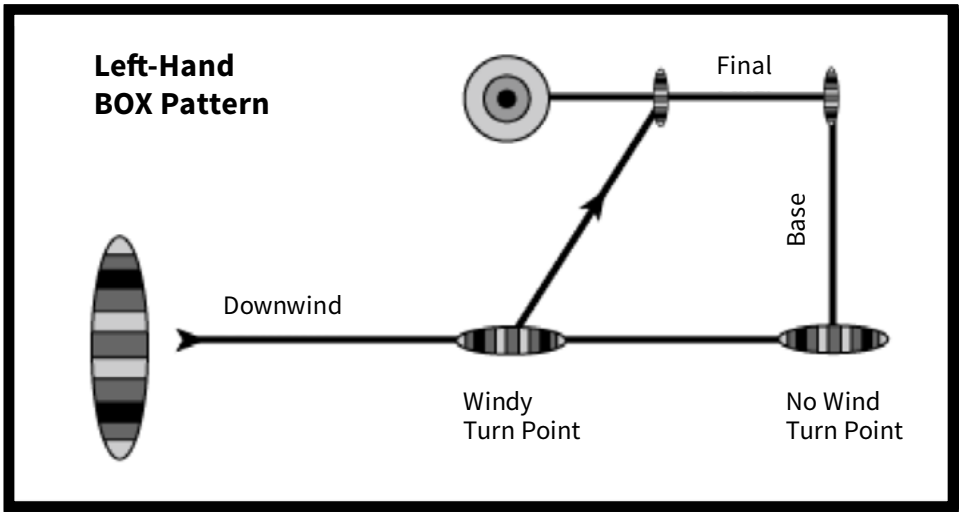


Figure 20: Landing Pattern

ACCURACY LANDINGS

30 Stand-Up Landings within 10 metres of the target centre, consisting of:

- (10) No wind/light wind accuracy
- (10) 5-10 mph
- (10) 10-18 mph
- Full Flight Approach
- Braked Approach (5-10 mph wind, no turbulence)

WHY?

The ability to land precisely in a planned location is essential for safe parachuting. This allows the pilot to negotiate constrained landing areas in the event of an off-field landing, eliminating the need for last minute corrections due to a faulty approach. Such missed approaches in tight landing areas often result in accidents.

Replication of the approach in varied conditions is also an important part of the demonstration of this skill, and is required for the fulfillment of this skill category.

Landing hard on target is not the goal of this exercise. Therefore, it is also part of the requirement to land softly without the need for a PLF. This requires a more advanced understanding of the parachute so that the descent rate can be negated prior to landing. A "Flared Landing" requires accommodation of the horizontal "float", so the approach target must be downwind of the actual landing point.

Depending on the size of the landing area, a full speed approach may or may not be appropriate. Therefore, it is necessary to demonstrate the ability to make steeper brakes approaches as well. Such a method becomes crucial for small landing areas.

HEADING CHANGES IN THE LANDING SURF

- Set up a final approach approximately 45 degrees off the windline
- Achieve zero descent rate within 5 feet of the ground
- Roll and Yaw the canopy into the wind
- Recover the bank angle to zero without overcorrection about the roll axis
- Complete the flare for a soft, stand-up landing

SPECIAL CONSIDERATIONS:

Airspeed is necessary for the performance of a level flight turn. It is not necessary, however, to accelerate the parachute beyond full flight glide in order to perform the manoeuvre.

It is essential that this manoeuvre be rehearsed numerous times at altitude prior to attempting it close to the ground. Roll axis wobble due to overcorrection can result in hard landings, and practice is the only way to become comfortable with the roll axis instability experienced at a high angle of attack.

WHY?

Controlling the heading throughout the landing process is essential for safe canopy flight. The increased airspeed and groundspeed exhibited by smaller parachutes causes longer landing surfs as well as a longer period of time in this phase of the landing. This increases the risks of colliding with obstructions on the ground as well as other canopy traffic. The skill of controlling the parachute heading while maintaining level flight is therefore even more important on parachutes with higher wing loading, and for pilots working on advanced approach techniques.

In the event that the landing area is narrow and off the wind line, the ability to make a crosswind approach allows the pilot to reduce the risk of hitting an obstacle on the ground by overshooting the landing site. Making a heading change back into the wind during the landing flare reduces groundspeed substantially, as well as the distance covered across the ground.

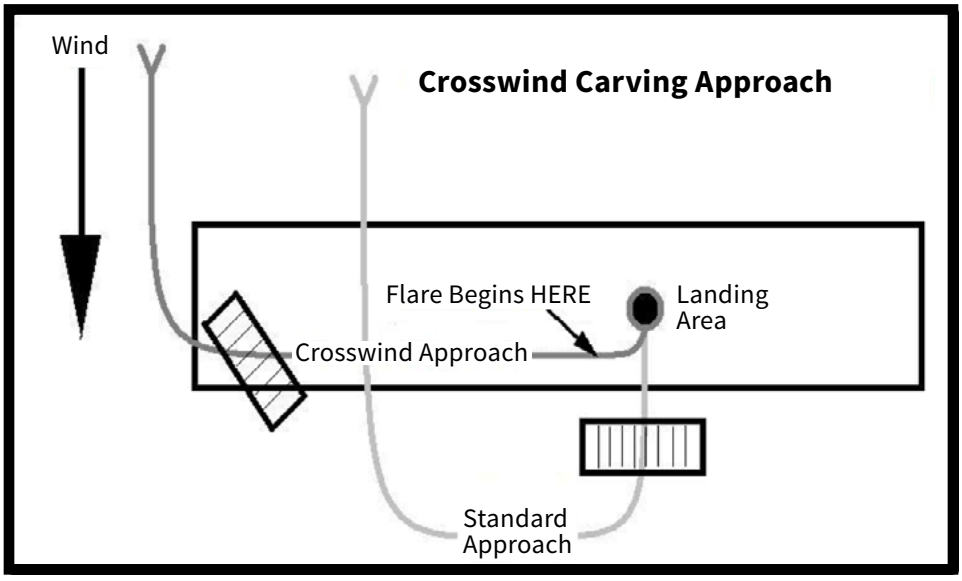


Figure 21: Crosswind Carve

CROSSWIND LANDINGS

- Set pattern and final approach 45 to 90 degrees off the windline
- Complete Level-Off within touching distance from the ground
- Complete the landing flare for minimum groundspeed landing
- Slide or PLF landing should be performed, rather than attempting to run

SPECIAL CONSIDERATIONS:

Attempting to run out a crosswind landing significantly increases the risk of injury. The jumper must place the heels on the ground first facing the direction of motion, and then gradually ease back onto the butt toward the completion of the landing. It is also important to continue the flare while sliding for the lowest possible groundspeed.

Do not attempt the crosswind landing exercise above 10 miles per hour ground wind velocity. In the event that the jumper is forced to perform a crosswind landing in high winds, it is advisable to carve the canopy into the wind during the landing flare as much as possible, without touching down with significant bank angle.

Crosswind landings must always be performed away from the normal landing area to avoid creating a traffic hazard. Further, the site chosen for this manoeuvre should be clear of rocks or other obstacles, and should be level terrain. Heading changes may be necessary on any landing, and looking forward toward the direction of flight is crucial.

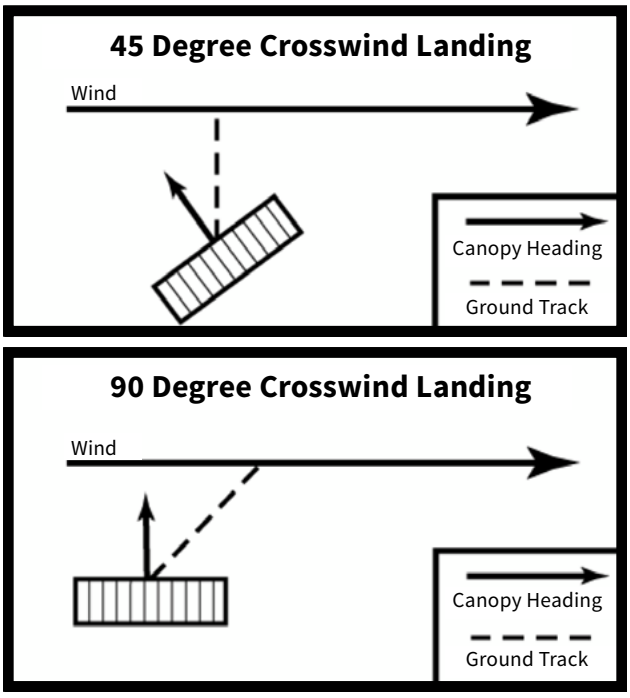


Figure 22: Crosswind Landing

*Do not attempt to land more than 90 degrees off the wind line while practising this exercise.

WHY?

If a pilot is not accustomed to landing with high groundspeed, they will be more likely to attempt to make a dangerous low turn to face into the wind. If, however, they have practised landing crosswind, they will be prepared for the additional challenges with this type of approach.

NO CONTACT FORMATION FLIGHT

Flying relative to another canopy at altitude presents an unparalleled learning opportunity. While exploration of a parachute's flight modes is essential training, in order to truly understand the results of the control inputs, a pilot needs a relative reference. Although such drills are very important in the cultivation of canopy flying skills, there are a number of safety concerns that must be addressed prior to the jump.

1. Only fly with one other canopy at a time. Losing sight of another parachute presents the greatest risk in formation flight. Do whatever is necessary to remain in visual contact with your wingman. If you lose visual, maintain your flight path until you re-acquire the other canopy.

2. Never approach another canopy head on. The closing speeds of two parachutes flying toward each other can be staggering, leaving little time for evasive action.

3. When flying within 200 feet of another canopy, match heading and descent rate prior to moving closer. This reduces the risks that both pilots will attempt to manoeuvre closer at the same time.

4. Establish a Base. When flying in close proximity, it is important to have one canopy remain still in order to create the best possible learning environment. The whole point of the exercise is to establish a relative reference, and a base that is moving around will make things much more difficult, and quite possibly more dangerous.

5. Know where you are. It is easy to lose track of your location when engrossed in relative flying. Therefore it is essential to take periodic glances at the ground to determine if a course correction is in order. Landing off DZ in formation is not the goal.

6. Know how high you are, and have an obvious break-off signal above minimum cutaway altitude. An audible altimeter can be a useful tool for this, but ultimately it is you who must judge your altitude.

7. Never look away from your wingman for more than 1 second when in close proximity. In the time that it takes to check an altimeter or ground reference, the distance between the parachutes can disappear. Maintain your global awareness of the situation as a sidebar to your relative flight. Landing off the DZ is less dangerous than a wrap.

8. Have a plan in the event of a canopy wrap. Although no-contact flight almost never results in a collision, the possibility remains. Think your procedures through carefully.

HELPFUL HINTS:

- In the event of mismatched airspeed and descent rate due to disparate wing loading, have the slower canopy open 300-500 feet lower.
- When the other canopy is stuck behind you, turn your parachute 90 degrees to reduce the closing distance.
- When in close proximity, make all your course corrections slowly and predictably.
- Communicate clearly and concisely. Have hand signals or air-to-air communications. The ability to talk increases the value of the exercise immeasurably.

NO CONTACT DRILLS:

1. **Matching Flight Path (Slow, Medium and Full Glide modes)**
    - It is crucial that a stable no-contact formation be established before moving on to more dynamic drills
    - Becoming accustomed to being in close proximity to another canopy is useful in preventing undue stress on the pilot on final approach in the event of traffic
    - Do as little as possible to maintain relative proximity
2. **Synchronised turns of 45 degrees or less**
    - Maintain proximity
    - Maintain relative altitude
    - Use any and all control inputs to maintain proximity
3. **Synchronised turns of more than 45 degrees**
    - Switch to other side of formation to cut down closing distance
    - Maintain levels
    - Do not look away during the turn
4. **Dive, Pause, Rebuild**
    - When one canopy dives down and then resumes full glide, they provide a base that the chasing canopy can target

- This drill allows the chase-pilot to practise "Dive Arrest" in the event that they are going low
- This is the same skill necessary for preventing low turn injuries

COMPLEX APPROACHES ON SMALL CANOPIES:

When learning to fly any parachute, all kinds of approaches must be rehearsed. This includes increased airspeed approaches. If a pilot is only comfortable with full flight airspeed, they are likely to panic and make mistakes in the event that they are forced to increase the airspeed as a result of an unexpected evasive manoeuvre. It is therefore a part of the learning process to cultivate the skill of steep, high-speed approaches.[11]

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PREVIOUS: SECTION 3 | Recreational Equipment Skills
NEXT: SECTION 5 | Recreational Freefall Skills

4.1 INTRODUCTION

In-flight skills are the term for all those activities which are done in and around the aircraft, including exits. In this section, you will learn additional information on such things as seating, spotting, and different exits.

4.2 LARGE AIRCRAFT LOADING AND SPOTTING

The key points mentioned in PIM2A should be kept in mind while loading a larger aircraft. Some new points to consider are multiple groups, group arrangement, seating and centre of gravity, communication, emergency exits, and spotting. You need to consider the exit order in order to understand the loading order. (See **§4.3 Exit Order**).

GROUP ARRANGEMENT

When loading larger aircraft you may be tasked with selecting a load order with multiple groups of varying experience, sizes, and types, including solo jumpers. Consider the groups in order of size or capability.

- Jumpers performing freefly and sit flying should exit AFTER belly fliers. While freefly fall rates are often faster than Formation Skydivers, the freefall drift is less.
- Leave at least 5-10 seconds separation between groups, **depending on the strength of the upper winds and the aircraft exit speed**. Higher winds = more time required between exits.
- Smaller, slow planes and high wind requires an extended separation delay while larger, fast planes with no wind could be a very short time (e.g. 5 seconds). Remember, it is the exit (launch) time, not time to start climb out (which also takes time). (See **PIM 2A**.)

RESOURCES:

EXIT SEPARATION, AVAILABLE AT:
DROPZONE.COM/SAFETY/EXIT/EXIT_SEPARATION_979.HTML

EXIT SEPARATION REVISITED, AVAILABLE AT:
DROPZONE.COM/SAFETY/EXIT/EXIT_SEPARATION_REVISITED_628.HTML

EXIT SEPARATION WITH MELISSA NELSON, AVAILABLE AT:
MELISSAAIRHEART.COM/EXIT-SEPARATION-TIME-REALLY-MATTERS/

When dispatching one group after the other, the following group must start to "Get Ready" in the door as soon as the other group has left the door; this early set up is part of the count of separation. Never count the delay and then get ready—you will cause problems for the groups after you. The only exception to this would be if the group following were just going to run out in single file with no door preparation; this group should delay just as a solo jumper would.

- Solo jumpers working on basic skills should always exit after groups with no less than 5 seconds delay between them.
- If a group is intending to do Canopy Formation Skydiving or there was a tandem or wingsuiter, then these groups would have to exit last.

SEATING AND CENTRE OF GRAVITY

As large loads usually consist of groups, loading by weight is not usually practical. The only thing that we can do is to load and sit in a fashion that keeps the overall weight forward and within the aircraft's weight and balance limits. The best way is to sit facing toward the rear of the aircraft, keeping our backs straight and sitting between each other's legs. Seating the jumpers 2 and 3 across, or 2 and 1 staggered to keep the load forward in the aircraft is also a good idea. Letting skydivers get too relaxed or lazy is dangerous as the weight moves to the rear of the aircraft. Keep it forward! Remember to do up your restraining devices (seatbelts). In addition, do not get up too early and drift towards the rear of the aircraft as this can cause problems with aircraft control.

KNOW YOUR AIRCRAFT. Between drop zones, there are different runway lengths, different aircraft types—some with side or middle benches or none—different exit doors (e.g. side door like the Twin Otter or Caravan, some rear door exits like the Skyvan or CASA), different pilots who will all have their own preferences and different exit light indicators (e.g.: green-yellow-red). You should enquire at your DZ Briefing about the specifics of loading, sitting (e.g. seatbelts) and exit procedures.

COMMUNICATIONS

In large aircraft, it is important to establish a line of communication between the pilot(s) and the spotter at the rear exit door. This is done by designating someone to relay the signal to a loadmaster's assistant positioned near the pilot, or the use of a spotter control panel at the door consisting of three buttons, left turn, right turn, and exit. The jumpers should be briefed prior to take-off and vision must be maintained prior to the exit so that signals can be passed between the two loadmasters. If there are groups exiting from different altitudes, the rest of the jumpers should remain seated. Jumpers should stay away from the door to watch the previous groups fall away—the change in the CoG can be dangerous (potential stall) and makes the pilot's job very difficult.

EMERGENCY EXITS

The basic rule for an emergency exit remains the same: the pilot is in command. The loadmaster will keep control of the load and everyone must wait until the pilot gives an order. If the aircraft is high enough and the pilot wants everyone to exit, then have the load stand up and exit in single file quickly with about an arm's length between each other. Avoid allowing a mass rush to the back to occur, nor any jam up or practice exits. A sudden load shift to the rear of the plane is still extremely dangerous.

If the decision is to land, have everyone attach their seatbelts, put on and fasten their helmets, and keep everyone seated and still until the aircraft has landed and come to a complete stop. At this point, have everyone exit the aircraft as quickly as possible and get well away from it. ALWAYS remind the pilot to be aware of AAD's that are on board; if possible turn them off.

TIP: 3X3 CHECK

- COMPLETE YOUR GEAR CHECK BEFORE THE PLANE ARRIVES, AND BEFORE EXIT.
  - THE **3**-BY-**3** CHECK
    - **3** HANDLES
    - **3** STRAPS
    - **3** ACCESSORIES
  - PLUS **2** PINS
- KNOW DIRECTION OF JUMP RUN, EXIT PATH, TRACK DIRECTION, LANDING DIRECTION BEFORE BOARDING THE AIRCRAFT.
- FIND OUT WHO IS BEFORE YOU/AFTER YOU.
- SIT AS FAR FORWARD AND SIT UP STRAIGHT (NOT SLOUCHING) IF THE LOAD IS FULL.

SPOTTING

Larger aircraft will be spotted by the pilot using GPS. The first group out should make sure the exit spot and flight line path is good and clear of other aircraft. If you have to spot, due to the nature of the door and the size of the aircraft, spotting a large plane can be more difficult. Ask for the assistance of an experienced Instructor. The plane's higher ground speed and jumping from higher altitudes also makes the job more challenging.

Tips for spotting are as follows:

- Get your head well outside the door and use the horizon for your ground reference.
- When calling for corrections keep in mind that a larger plane will respond more slowly than you may be used to in a smaller plane like a C-182.
- Have your group prepare earlier by getting ready in the door—you do not need to wait for the Green Light to get ready. Getting used to the faster forward speed may take a couple of tries.

RESOURCES:
HOW TO BE A GOOD PASSENGER IN A JUMP PLANE, AVAILABLE AT:
SKYDIVESTLOUISAREA.COM/PASS.HTM

4.3 EXIT ORDER

The exit order refers to the order in which groups or individuals exit the aircraft. Exit spacing (the time + distance between exits) and exit order (determining which group or discipline exits when) has become more complicated with additional variations in jump types (e.g. wingsuits, flocking dives), and aircraft (larger aircraft, higher, more passengers). The exit order must take into consideration fall rates, size of the group(s), type of jump discipline, and canopy activation altitude. Generally, the order is skyboard, group FS (largest to smallest), solo FS, freefly (largest group to smallest), and followed by students and tandems. Though PFF, solo freefall and tandem students may drift farther than freeflyers, instructors are better able to control the exit timing to provide adequate separation. Their deployments are also usually higher than licenced jumpers' deployment, so the long spots are generally not a problem. If there are any wingsuit flyers on the load, they will usually exit last since they cover a lot of horizontal distance; they must fly a pattern that keeps them away from other jumpers during freefall or canopy opening. Exiting in this order will help the groups to remain safely separated prior to deployment. The exceptions to this are wingsuits and skyboards.

A recommended[12] exit order for activities is:

1. Lower altitude (Hop-n-Pop)
2. Skyboards (Sky surfer)
3. FS (larger groups to smallest)
4. Solos, belly-to-earth
5. Freefly (larger groups to smallest)
6. Students (e.g. PFF)
7. Tandems
8. CFS or high opening canopies
9. Tracking Dive
10. Wingsuits

12 You should always check what the local drop zone rules are.

Remember to put a safe exit distance between each group/individual, considering group size, and **depending on upper winds and aircraft ground speed**. If a group of eight or more jumpers are exiting, more time is required before the next exit. Be aware that larger formations will have higher break-off altitudes and greater track distances in order to create safe separation. Try this online freefall simulation to see how wind drift affects freefall and opening separation: **lensmoor.org/cgi-bin/chute.cgi**.

RESOURCES:

GRAPHICAL ANIMATION OF FREEFALL DRIFT, AVAILABLE AT:
OMNISKORE.COM/FREEFALL_DRIFT2.HTML

EXIT SEPARATION REVISITED, AVAILABLE AT:
JUSTSKYDIVERS.COM/SKYDIVING-VIDEOS/OTHER/SKYDIVING-EXIT-SEPERATION-REVISITED

APF EXIT SEPARATION, AVAILABLE AT:
APF.ASN.AU/MEMBERS/INFORMATION/EXIT-SEPERATION/DEFAULT.ASPX

SKYDIVING RESOURCES, AVAILABLE AT:
MYPAGES.IIT.EDU/~KALLEND/SKYDIVE/

4.4 REHEARSAL WITH RELAXATION

The rehearsal with relaxation is a combination of two previously learned skills. The steps for mental rehearsal were discussed in the Basic Preparation & Basic In-Flight Skills. Relaxation was discussed in the Recreational Preparation Skills (of **PIM2A §2.3.1**). Since both rehearsal and relaxation are directed towards improving performance, it would seem worthwhile to combine them during the climb to altitude.

The three steps are:

1. Mentally rehearse the performance 3 times through correctly (or as many times as needed), after the take-off; this should take no more than 3 minutes;
2. Plan to mentally rehearse the performance at pre-set altitudes (e.g. 3000', 8000'); and

3. Perform the relaxation exercise for the duration of the climb to altitude between mental rehearsals.

    - Repeat the mental rehearsal (once or twice through) about 2 minutes prior to exit (~1,000' below jump altitude in small aircraft, to 3,000' in larger aircraft)

At the end of the rehearsals and relaxation, get involved in physical activities such as checking your gear, observing the aircraft altitude and airspeed, orienting yourself in relation to the DZ, and moving into your "Get Ready" position. While doing this try to move smoothly to avoid sudden shift of load in the aircraft, which is not only easier on the pilot but a safety concern.

RESOURCES:

MENTAL REHEARSAL—ATHLETICS WIKI—ATHLEPEDIA, AVAILABLE AT:
ATHLETICS.WIKIA.COM/WIKI/MENTAL_REHEARSAL

RELAXATION, AVAILABLE AT:
BRIANMAC.CO.UK/RELAXATION.HTM

MENTAL IMAGERY IN SPORT, AVAILABLE AT:
BRIANMAC.CO.UK/MENTAL.HTM

KEY TO IMPROVING SPORTS PERFORMANCE, AVAILABLE AT:
WHOLESCIENCE.NET/2012/07/MENTAL-REHEARSAL-KEY-TO-IMPROVING-SPORTS- PERFORMANCE/

CFHS—ROAD TO MENTAL READINESS—THE BIG 4, AVAILABLE AT:
FORCES.GC.CA/ASSETS/FORCES_INTERNET/DOCS/EN/CAF-COMMUNITY-HEALTH- SERVICES-R2MR/R2MR-POCKET-CARD.PDF

CFHS—ROAD TO MENTAL READINESS—GUIDE, AVAILABLE AT:
FORCES.GC.CA/ASSETS/FORCES_INTERNET/DOCS/EN/CAF-COMMUNITY-HEALTH-SERVICES-R2MR/R2MR-AIDE-MEMOIRE.PDF

4.5 SPOTTING

Why is spotting so important for everyone to learn and use, even from larger aircraft? The ability to spot allows you to:

- Choose the correct exit point for freefall in order to get you to the safe opening point to be able to fly your canopy back to the drop zone safely.
- Ensure safe separation on exit in order to have safe separation at opening; helps to avoid potential collisions during deployment.
- Correct for variable wind conditions throughout all altitudes.
- Determine exit spacing for larger to smaller groups and specialty types of flying (e.g. CFS [Canopy Formation Skydiving], sky board, wing suit, etc.).
- Meet the requirements to achieve your Certificate of Proficiency ratings.
- Decide whether or not to get out, even if the green light is on.

What are your responsibilities for spotting?

- Determining the exit spot and opening point on the ground before boarding.
- Determining who is exiting before and after you.
- Knowing what is a safe separation time between exits. This changes depending on who is ahead of you. For example, larger group, more separation time.

TIP: SPOTTING

THE FIRST PERSON OF THE NEXT GROUP SHOULD BE LOOKING AT THE GROUND SPOT IMMEDIATELY AFTER THE PRECEDING GROUP HAS LEFT, WITHOUT DELAY.

Other things to spot:

- Other aircraft approaching horizontally. An aircraft 2 miles away will be under you in 60 seconds.
- Clouds.
- Prematurely opened canopy or reserve.

In Canada, more and more drop zones have large turbine aircraft. It is an advantage for the jumpers, but it generates a problem in training for spotting. Indeed, the exit point is often determined by GPS, and worse still the novice is positioned far from the door if following the proper exit order. It is frightening to see a parachutist opening the door and jumping immediately after the pilot turns on the green light **without ever looking below** for the ground or other in-air traffic! You have the opportunity to change this widespread behaviour by educating new jumpers about spotting from large turbine aircraft.

Devote time on the ground to discuss the strength and direction of the winds in relation to the ground, use an aerial photograph of the landing site and the Flight Data weather reports. In the aircraft, use the seconds between the departure of the preceding group and your exit to look out the door.

You should locate the landing zone, and confirm that there is no traffic below. Before the exit, look below, then after a short analysis of the ground, you can exit. The use of large turbine aircraft and GPS forces us to be innovative to determine the exit point.

RESOURCES:

SPOTTING—SPORT PARACHUTIST'S SAFETY JOURNAL, AVAILABLE AT:
MAKEITHAPPEN.COM/SPSJ/SPOTTING.HTM

LEARNING TO SPOT IN A GPS WORLD, AVAILABLE AT:
PARACHUTISTONLINE.COM/FEATURE/LEARNING-SPOT-GPS-WORLD

LEARNING SPOTTING ONE JUMP AT A TIME, AVAILABLE AT:
USPA.ORG/SIM/READ/SECTION4/ARTICLES/LEARNINGSPOTTIN-GONEJUMPATATIME/TABID/217/ DEFAULT.ASPX

SKYDIVING—EXIT SEPARATION REVISITED, AVAILABLE AT:
JUSTSKYDIVERS.COM/SKYDIVING- VIDEOS/OTHER/SKYDIVING-EX-IT-SEPERATION-REVISITED/

▶ 4.5.1 RATE ONE TURN

A Rate One Turn (a two-minute turn) can be used to assess wind speed and direction at various altitudes. The two-minute, 360° turn, completes a spiraling circle in the air (see next diagram)

and can be used to estimate drift. A line from the starting point to the ending point on the ground indicates the direction of the wind and the length of the line is the approximate distance that will be covered in two minutes. This direction and distance of the wind is called drift. For example, a two-minute drift of one kilometre indicates a wind of 30 km/hr. A 60-second freefall through this wind would cause a freefall drift of 500 metres. A Rate One Turn can be used when a WDI is not available; however, realise that a light jumper under a large canopy may back up at this wind strength. The request for one or more Rate One Turns during the climb must be coordinated with the pilot during the pre-jump briefing. Rate one turns can be very useful to determine upper winds, which will help in calculating for freefall drift.

TIP: WINDS ALOFT

WINGSUITERS AND TRACKING DIVERS MAY WANT TO WAIT UNTIL THE SECOND OR SUBSEQUENT LOADS, WHEN THE DAY'S WINDS ALOFT ARE BETTER UNDERSTOOD.

Ground Position Change After a Rate One Turn

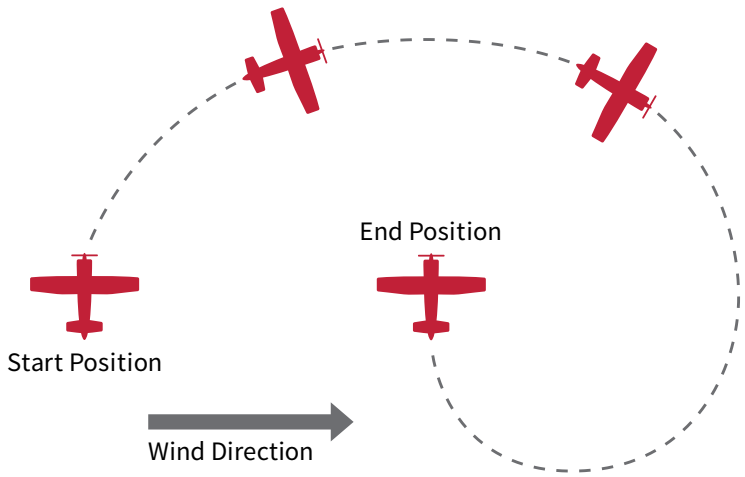

Figure 23: Rate 1 Turn

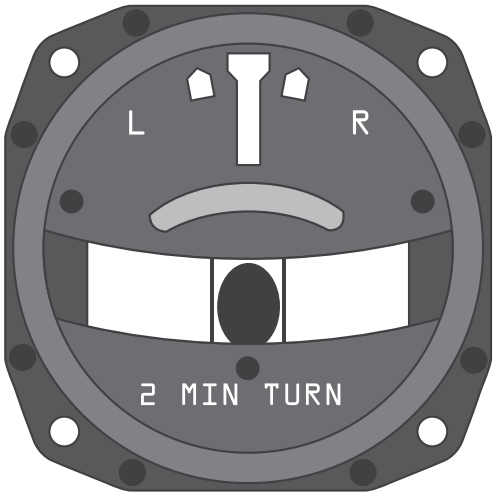

Figure 24: Aircraft Rate 1 Turn Indicator

RESOURCES:

RATE ONE TURN TECHNICAL INFORMATION, AVAILABLE AT:
EN.WIKIPEDIA.ORG/WIKI/ROT_(AVIATION)

▶ 4.5.2 SPOTTING FOR FS

Spotting for FS is different from spotting for yourself for a couple of reasons. First is the fact that it takes the group more time to get set up for the exit, and as a result the door opening and the climb out needs to be initiated sooner (on Red or Yellow light) than for a solo exit. Secondly, because there may be more than one group leaving on that pass, consideration must be made for those groups getting out after the first group. This can get tricky and varies with aircraft and wind conditions. It is recommended that you team-spot with an experienced multi-group spotter prior to attempting to spot a large aircraft load by yourself. Remember, when spotting keep in mind the three spots that need to be calculated:

1. The Climb Out Point—allow more time for larger groups;
2. The Exit Point—allow for freefall drift; and
3. The Opening Point—the point where you want to be opened as determined by the wind drift or Rate 1 Turn.

Depending on the winds, altitude, solo or group, and plane type these spots could be the same or miles apart.

4.6 DIVE-TO-DELTA EXIT

This exit allows you to transition from a dive exit to a delta of varied steepness (angle). You must be able to do a successful dive exit and transition to a delta in order to perform this exit.

NOTE: THE DELTA IS USED TO CLOSE **VERTICAL** DISTANCES QUICKLY AFTER EXITING THE AIRCRAFT.

To perform a dive to delta exit:

- Dive out of the plane.
- In a large aircraft, the most simple dive out to begin with is to launch off the left foot, raise the right knee and right arm high after you clear the door, and present your torso to the forward relative wind; you are actually going to dive out sideways, reaching for the tip of the wing as you launch.

- Hold this position hard, and you will automatically rotate on the airflow to face down and toward the rear; just let it happen naturally.
- Once you are accomplished at this type of exit, try a more difficult exit: launch 45° down toward the bottom tail of the aircraft. Make sure your feet are tucked up tight into your butt to keep from rolling over.
- In a smaller aircraft, roll over your left foot on the step, arms stretched out in front, at a 45° down angle, and tuck your feet up tight into your butt to keep from rolling over. Avoid pushing off the left foot—simply roll off the step as though you are falling, without any force.

Once you lose the forward throw and are in the process of coming to a flat position, transition to the delta position and hold it. Adjust the steepness as necessary toward the right side of the target (never directly at).

This type of exit and body position is very useful for Formation Skydiving when diving out and docking on a base of a larger formation. Priority one with this exit is stability and flying the relative wind. Go one step at a time and the speed and smoothness will come with experience.

4.7 REAR FLOAT EXIT

This technique allows you to exit balanced while floating. As you exit from the aircraft, delta and head toward the formation centre.

For rear float exit:

- Exit on aircraft heading.
- Hold the delta position until you lose the forward thrust of the aircraft.
- Then go to the boxman position.

This kind of output is very useful for training in freefall when you float and then approach the base. When you float towards the base, you must determine the degree of reverse arch or movement necessary in order to achieve docking the position while keeping control at all times. As with any other exit, your priority is stability and flight in the relative wind. The speed and control will come with experience.

4.8 FLOATER TRACK EXIT

This exit allows you to transition from a poised exit to a floater track, maximizing the forward throw of the aircraft to track back “up” and into the relative wind. You must be able to do a successful on-aircraft-

heading exit and a successful delta and track in order to do this exit.

To do a floater track exit:

- Exit directly on aircraft heading.
- Adopt the track position and hold it until you lose the forward throw of the aircraft.
- Transition back into the box position at this time.

The key is to try to remain as close as possible to the formation and avoid separation. In addition, on the launch you need to make sure you are in clean air, especially if surrounded by other floaters. You may need to launch far out to the side, or drop off a tad early, downward and track back upward. If you are a front float, you need to keep your head turned to watch the formation; when you become expert, you will be able to rotate your position during the float track and turn to face the formation at the same time.

The "Super Float" Position is used in larger formations or multi-plane formation jumps, and leaves on "Ready!" In a multi-plane formation, this signals the other aircraft jumpers to exit.

This type of exit is very useful for Formation Skydiving when floating and docking on a base. When floater tracking to a base, you have to adjust how much reverse arch or forward movement you require in order to end up in position to dock while still being in control at all times.

As with any exit, priority one is stability and flying the relative wind. Speed and smoothness will come with experience.

4.9 LEARNING TIGHT EXITS: 1-ON-1

You should develop consistency in the following skills before attempting first formation exits:

- A balanced set-up.
- A tight exit getting all jumpers off the plane at once.
- A good body position immediately upon launching.
- Proficiency at T-exits.

More about these four principles can be found in **§4.12 In-Flight Technical Knowledge**.

It is best to start by taking off basic first points that are similar to the T-exit. Points such as a star or stairstep diamond are good first points to begin learning.

There are four main exit positions. It is important to practise these positions during your skill development, as you will be using each of the exit positions when you proceed to 4-way formation FS.

FOR THE C-182/C-206

The four positions, as displayed in the diagram, are:

- **A** OUTSIDE ON THE WHEEL (FRONT FLOATER, POINT)
- **B** IN THE "V" OF THE STRUT (INSIDE CENTRE)
- **C** ON THE STEP/WHEEL (CENTRE FLOATER, OUTSIDE CENTRE)
- **D** IN THE DOORWAY (REAR FLOATER, TAIL)

You should practise each position on a jump at least two or three times, to ensure that you are comfortable and can achieve a stable launch into the relative wind. A description of the set-up and launch of each of the positions follows. These descriptions are written for a vCessna 182. The instructions will have to be adjusted somewhat for a C-180/5 or C-206U.

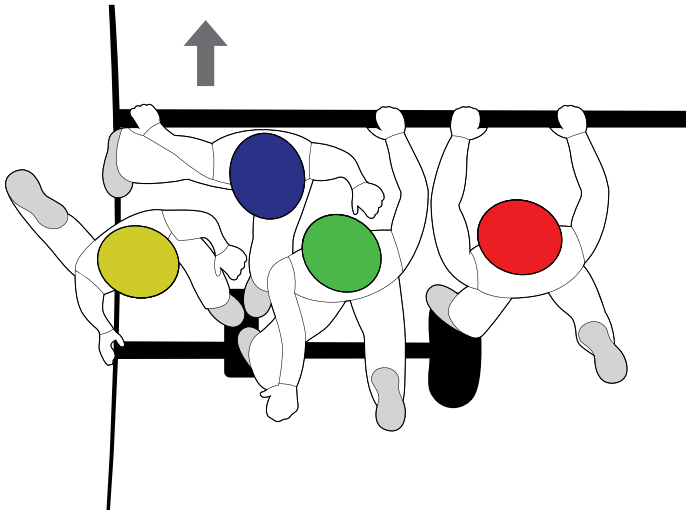

Figure 25: 4-Way Exit from Cessna

For all exits, it is important to be overlapped or right beside your partner to eliminate separation after exit. The set-up should be tight and balanced. The launch should be timed exactly with your partner and your chest/torso must be presented to the relative wind immediately on exit. All exits should be free-flown in order to develop body awareness to “fly” off the aircraft.

A THE WHEEL (POINT OR FRONT FLOAT)

Set-up with both hands on the strut in front of the body as far out towards the end of the strut as possible. Have the left foot on the wheel (Note: brake on), while the right leg is trailing in the airflow. The left leg and both arms will be bent for the launch. Have the head turned towards the aircraft. The torso will be on the relative wind. The launch is the same: eye contact, nod (Ready), movement down by bending the knee (Set), and then launch straight back (Go). After success with this set-up, you can modify the position to lean further out towards the end of the strut. In this set-up, have the right hand and forearm resting in the top surface of the strut with the torso slightly turned towards the

aircraft. The launch motion will incorporate a stronger extension of the right arm so that you achieve a correct position in freefall with the chest facing directly toward the direction of aircraft flight.

B THE "V" OF THE STRUT (INSIDE CENTRE)

Use caution when in this position. Get assistance to move into this position when first trying it. This set-up position requires that you start from beside the pilot, moving out onto the step facing towards the tail. Reach out with the left hand, grip the strut, and pull yourself out while keeping the torso bent forward and low. Push backwards until your butt is resting on the strut. Note: Care must be taken to ensure that no part of your equipment is snagged as you move into position. The right hand will be positioned on the leading edge of the wing. The left foot will be positioned with the toe against the outer front corner of the step or the front inside edge of the wheel. The right foot will be positioned where the strut meets the aircraft fuselage. When positioned, you should be about 30 cm away from the side of the aircraft, sitting on the strut. When ready, move the right hand to the correct grip.

The launch begins with eye contact and a nod (Ready), a downwards motion with the head and shoulders (Set) and a launch forward (Go).

For the launch, emphasise these key points:

- Maintain eye contact throughout the launch and freefall.
- Extend the right leg while allowing the left leg to fold or collapse.
- Move the shoulders downward so that after launch, the body is in a head-down attitude extend the arms to a locked box position, let the legs fold at the knees and place your heels on your butt (after the initial push with the right leg).
- Control downward pitch by flattening or creating a reverse arch with the upper body.

C THE STEP—POISED (OUTSIDE CENTRE)

Have the left foot on the step and the right leg trailing in the airflow. The right hand will be positioned on the strut. The left hand may be on the strut, the front of the doorframe or the rear of the doorframe. The right leg and both arms should be slightly bent to assist with the launch. The launch action follows eye contact with a nod (Ready), a movement down by bending the knee (Set), followed by the step back and arm extension of the launch (Go).

D THE DOORWAY—DIVE (TAIL, REAR FLOAT)

You will remain in the doorway with your left foot on the step and the other foot and knee will be resting on the floor of the aircraft. Have the left hand resting on a shoulder so that you can feel the motion during the launch. The torso will be positioned in the doorway, angled towards the tail. Note that the angle is set such that the right shoulder and the rig will clear the rear side of the

doorframe. The head will be turned outward for eye contact and the signals of the launch. For the launch, the actions are quite similar to those used for the "V": nod, slight downwards motion, then launch forward towards the aircraft tail. The leg in the aircraft doorframe provides the push, the leg positioned on the step should fold or collapse. The arms are placed in the box position and the torso is rotated downwards to finish in an inverted or head-down attitude.

NOTE: PREVIOUSLY, THE "SET" MOTION FOR THE COUNT WAS A SWING INWARD, AWAY FROM THE LAUNCH DIRECTION.

CURRENT METHODS PREFER A MOTION DOWNWARD (BENDING THE KNEE), WHICH ALLOWS A BETTER LAUNCH POSITION TO BE OBTAINED. THIS DOWNWARD MOTION ALLOWS THE JUMPERS TO USE THEIR MUSCLES FOR THE EXIT LAUNCH RATHER THAN CREATED MOMENTUM VIA THE SWING.

4.10 T-EXITS

T-EXIT: NO GRIPS

The T-exit is one of the basic 4-way exits. It is popular because it is easily adapted to almost any type of jump aircraft. The positions for each of the four individuals are described below. They are substantially the same as three of the four exit positions used in the 1:1 exits previously described.

Getting a good exit ensures getting off to a clean start in sequential FS. You will learn that the key points to a good exit are getting everybody off the aircraft at the same time. When this happens, everyone remains close together. Have everyone keep his or her heads close together. This takes some organization in the placement of each jumper and some skill in timing and flying on each jumper's part. Precise timing of the rock and placing the chest into the relative wind for stability after the launch ensures that the bodies will remain relatively close.

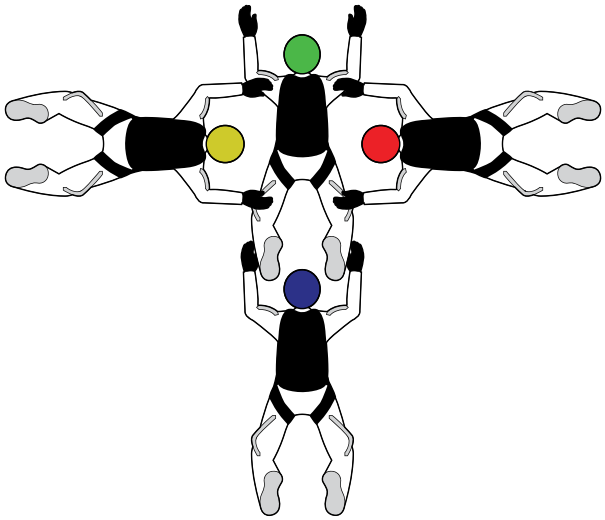

Figure 26: 4-Way T-Exit

The main purpose of beginning with a no grip exit is to help identify the importance of a good climb out and set-up, a precisely timed rock, and proper follow through into the correct body position to remain close to their partners. The end goal of the exercise is to master the ability to fly the formation off the plane with a minimum amount of tension to allow a close transition to the next formation. You will have to concentrate on keeping your awareness and reflexes sharp and begin flying prior to leaving the plane (during the count and rock). Using this exit, the chance of a funnel causing momentary disorientation is highly unlikely.

Specifics from a C-182 or similar aircraft are below. (Positions in brackets are for large aircraft that will require minor adjustments in the positioning.)

T-EXIT

A THE WHEEL (POINT OR FRONT FLOAT)

This jumper is first to exit, following the actions outlined for the 1:1 exit, outside on the step. They should take as little space as possible on the step/wheel. They may want to wrap their right arm around the strut (over the top), with their elbow on the strut's top surface for balance and the push during launch. To take a grip, they can use their left hand to rest on the arm of the centre “V” person.

For the launch, they watch the actions of the count, keying on the motion of the jumper in the “V”. The action should be to step off while presenting the chest to the relative wind.

They must make a specific effort to kick out and up from the centre of the formation with the left leg. A rotation of 90° towards the formation centre will occur naturally.

B THE "V" OF THE STRUT (INSIDE CENTRE)

This jumper is second to climb-out as the floater clears the door, using the actions outlined for the 1:1 exit, in the “V”. Note: Care must be taken to ensure that no part of the equipment is snagged as they move into position. The front door frame can be used for balance by wrapping the right arm back around it, or one can use the leading edge of the wing for support. This is acceptable so long as it does not bring them into an upright, off balance position on the strut. They should push themselves along the strut and away from the door as far as possible. For hand positions in the “T”, they can take the outside (right) arm of the floater with their left hand and the left shoulder of the jumper on the step with their right hand.

The jumper in the “V” may say the count and initiate the launch. They have eye contact with the others. For the launch, the motion is the same as that described for the 1:1 launch.

C THE STEP—POISED (OUTSIDE CENTRE)

This jumper is the third to climb out. They are moving to the standard poised exit position on the step. Once the jumper in the "V" is set so that the step is clear, they move into position facing forward, holding the strut with the hands. They will be standing with their left foot on the step and their right leg will be trailing in the airflow. They will keep their right hand on the strut, holding themselves in position. They may shift their left hand to the right shoulder of the person in the "V", or to the front or back of the doorframe. The door person and the jumper on the step have to share the step with their left feet. This position is the same for the 180/5, although a little more crowded than on the 182.

D THE DOORWAY—DIVE (TAIL, REAR FLOAT)

The fourth jumper is the last to get into position. On a 182 with a jump step there should be room for this jumper to stand facing forward on the step or wheel strut with their right foot, their left leg trailing. They will rest their right hand on the shoulder of the centre-step person and their left hand will rest on the right shoulder of the person in the "V". Their shoulders should be squared to the direction of flight. Their head will be turned to see both the center person and the person in the "V".

When a jump step is not available, jumpers should climb out is as for a 1:1 tight exit. Place your left hand on the step person's left shoulder and use your right hand to balance yourself during exit. For a 180/5 exit, there is not enough room for any foot placement on the plane, so this jumper sits facing the tail of the aircraft with both the feet dangling to the rear of the step. The jumpers must balance themselves sitting on the doorsill ensuring that their right shoulder will clear the rear of the doorframe.

For the launch, this jumper watches the motion of the jumpers on the step and in the "V". The jumper must lean forward into the center of the formation as it leaves and push their feet and legs out (under the aircraft body) while presenting their chest to the relative wind. Their motion is into the center of the formation. As the formation launches (not late) they try to kick the belly of the plane.

THE EXIT LAUNCH

The positions are simple to get into. Each is balanced and self-supporting. Any group doing a 4-way dive can start from these standard positions, using a combination of hand contacts and Freeflying. The free flown exit should be close and stable. From this exit, it is easy to fly to the first formation of the dive sequence. You should become familiar and capable in each of these standard exit positions.

You may learn little tricks and keys of your own to help become more confident and more consistent. Once you gain experience with these basic positions, it will be easier for you to learn new positions and grips. Eventually you will be able to launch any formation from any position.

The jumper on the step may also key the launch. They also have eye contact with the others. In any case, the jumper on the step must lead the exit. They must go on "Go". The others may have different keys and motions to watch, but the jumper on the step leads it all off the plane. They must make a positive motion away from the plane and present their chest to the wind. This may take more effort than solo exit since the jumper in the "V" may need to be pulled past the center of balance to start them away from the plane. Any push from the other jumpers or hesitation on the part of the jumper on the step may lead to an off balance launch, looping backwards through the center of the formation. They must think of themselves as leading the others off the plane. If the timing and balance are coordinated between all jumpers, the exit will be tight without needing closed handgrips.

T-EXIT: WITH GRIPS

As you progress to doing the basic linked exit there are some stages that can be practised to maintain consistency. These stages are the soft-contact exit and the grip switch. When performing the soft-contact exit, you should launch the T with light grips and try to keep the formation centered. If excessive tension or a stability problem is experienced, the individual or group should let go. Once the exit can be consistently launched with no tension, your group can start doing basic grip switches. Some of the easiest are the T to Star, T to zigzag, T to stairstep diamond, and T to open accordion.

When you are performing a grip switch, fly into position. Avoid pulling and scrambling into position. These actions can create problems with the formation or your partners. A tip to help the achievement of this is to emphasise that your arms should not reach full extension on the launch. Grip switching is a good exercise to develop immediate awareness and reflexes so that you can move and compensate through the launch. Always keep positive pressure towards the centre of the formation. It is not enough simply to hang on; you must continue to fly your position.

▶ COMPETITIVE 4-WAY TEAM

A competitive 4-way team consists of the following people:

A POINT (FRONT FLOAT OR FRONT DOOR-JAM INSIDE)

This person has the most individual flying to do, and often is out-facing (or, facing away from the formation). They need to be an excellent solo flyer and capable of backing up with precision. On Exit, the Point is the highest (up) in their placement relative to the other jumpers.

B INSIDE CENTRE (IC)

Exits with the OC, and positions themselves between Point and Tail. Moves to exit with the OC as one person. Placement depends on the formation, but usually is level with the OC.

C OUTSIDE CENTRE (OC)

This person takes control of the formation, and often has larger moves between formations, and must communicate well with the IC. They must be a confident and strong flyer who can hold position when getting knocked by the others.

D TAIL (REAR FLOAT)

Usually the last to dock on the formation, after visually seeing the others complete their slots. Tail is most always in-facing, and has to quickly adjust to shifts or rotations in the formations. The Tail is usually calm but very fast. On exit, the Tail is the lowest in the formation, leaving just slightly earlier than the OC. On exit set up, they should stand slightly lower, in preparation. Must anticipate the count; getting low will help. Tail should normally be looking up at the formation on launch.

RESOURCES:
SUCCEEDING IN 4-WAY—SLOT OVERVIEW—DAN BC, AVAILABLE AT:
PARACHUTISTONLINE.COM/FEATURE/ON-THE-LINE-PART2

4.11 FIRST FORMATION EXITS

Once again, you must develop consistency in the following skills before attempting first formation exits:

- A balanced set-up.
- A tight exit getting all jumpers off the plane at once.
- A good body position immediately upon launching.
- Proficiency at T-exits.

It is best to start by taking off basic first points that are similar to the T-exit in the section above. Points such as a star or stairstep diamond are good first points to begin learning.

STAR EXIT

Set up in the T positions previously described. The hand placements will be different from the T exit in order to take the grips.

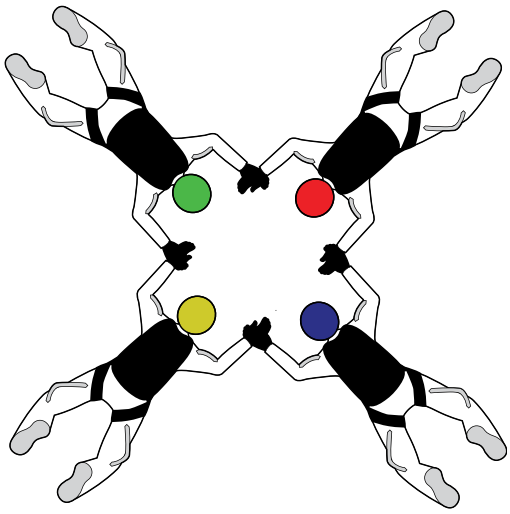

Figure 27: 4-Way Star Exit

- The step position (**OUTSIDE CENTRE**) grips the back door frame with their left hand and the strut with their right hand.
- The wheel position (**POINT**) grips the shoulder or arm of the skydiver on the inner step with their left hand and holds on to the strut with their right hand.
- The V position (**INSIDE CENTRE**) grips the shoulder of the skydiver on the wheel position with their left hand and step person's chest strap with their right hand.
- The door position (**TAIL**) will take grips on the shoulders of the skydiver on the step and in the V.
- Once all grips are taken, bring heads together and get eye contact across from each other.
- Either the step or V skydiver may initiate the count and rock. As you leave the plane, ensure that your arms do not extend. This will cause more of a whiplash effect if the timing is off. It also creates weak grips. It is hard to hold on with your fingers alone.
- After the exit is launched, the V position should drop the chest strap grip taken on the step person.

LARGE AIRCRAFT—STAR EXIT:

- **TAIL** and **OUTSIDE CENTRE** climb out. **TAIL** should be slightly forward of the rear door to give the **INSIDE CENTRE** some room.
- **TAIL** takes left grip on **OUTSIDE CENTRE** right arm.
- **INSIDE CENTRE** and **POINT** take up position in the door, left-foot forward to the edge of the doorframe, backs straight up, and turned slightly toward the relative wind.
- **INSIDE CENTRE** takes a left grip on **TAIL** right arm, and right grip on **POINT** left arm.
- **POINT** takes right grip on **OUTSIDE CENTRE** left arm.
- **OUTSIDE CENTRE** has no grips, just the door frame/bar.

LAUNCHING:

- **OUTSIDE CENTRE** gives the key (or count).
- **OUTSIDE CENTRE** leads with left leg, bringing knee out, presenting chest and hips into the relative wind.
- **TAIL** should leave a split-second early on the key, just enough to start to fall as the others are launching, and look up at the formation as it comes out.
- The inside jumpers do NOT push or force their exit; they simply follow the floaters out, turning their chests into the relative wind as they fall out the door, almost upside down.

TIP: STAR EXIT

YOU ARE NOT TRYING TO EXIT IN A PICTURE-PERFECT 4-WAY STAR. IT SHOULD BE "CHEATED".

STAIRSTEP DIAMOND EXIT

The set up for the stairstep diamond exit is a little different from the T or the Star exit. The general positions are all the same except for the skydiver inside the plane and the one on the outer step, who must present their legs to the other two.

The first step is to have your wheel skydiver move to the wheel as done above. They should angle toward the door after the leg strap is gripped.

The step skydiver (**OUTSIDE CENTRE**) will place the left foot on the step, trail the right foot, grip the left leg strap of the wheel skydiver (**POINT**) with their right hand and the back of the doorframe with their left hand.

The V skydiver (**INSIDE CENTRE**) will then back out into the strut taking the left arm of the skydiver on the wheel (**POINT**) and the left leg strap of the skydiver in the plane (**TAIL**) as they angle out presenting their left leg to the V skydiver's right hand (**INSIDE CENTRE**).

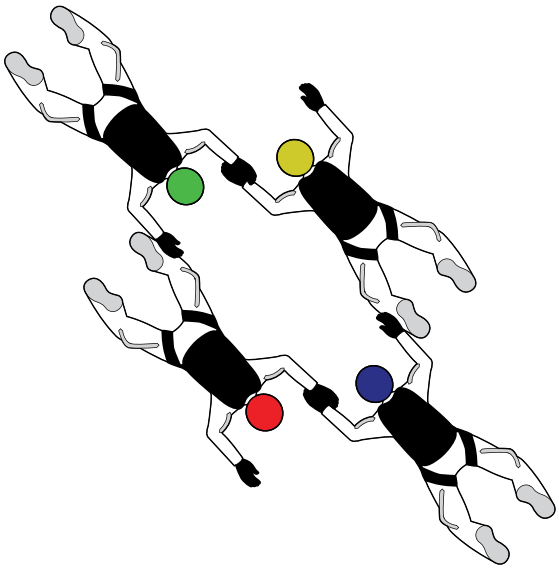

Figure 28: Stairstep Diamond

The door skydiver will step onto the wheel strut with their right foot while placing their left foot in the corner of the door, exposing their leg strap to the skydiver in the V. They should angle towards the wheel slightly and pick up the shoulder of the inner step skydiver with their left hand while steadying themselves on the back of the doorframe with their right.

The count will come from either the step or the V skydiver, and all bodies should be brought together with good cross eye contact prior to the count. As the stairstep diamond is launched, all skydivers must attain good arched body positions and maintain eye contact.

MEEKER EXIT

Set up in the T positions previously described. The hand placements will be different from the T exit in order to take the grips.

- The wheel position (**POINT**) climbs out as per the T exit and the left hand picks up the left leg grip from the V person.
- The V person (**INSIDE CENTRE**) climbs out taking the step person's chest strap with their left hand and the door person's right leg.
- The step person (**OUTSIDE CENTRE**) places their left foot on the step and trails the right leg. The right hand takes a grip on the wheel person's left leg and the left hand holds onto either the rear or front of the door frame.
- The door person (**TAIL**) places their right foot on the step facing the tail of the aircraft, allowing the V person to take the left leg grip. The door person picks up the step person's left leg with their left hand. The right hand balances the jumper in the door.

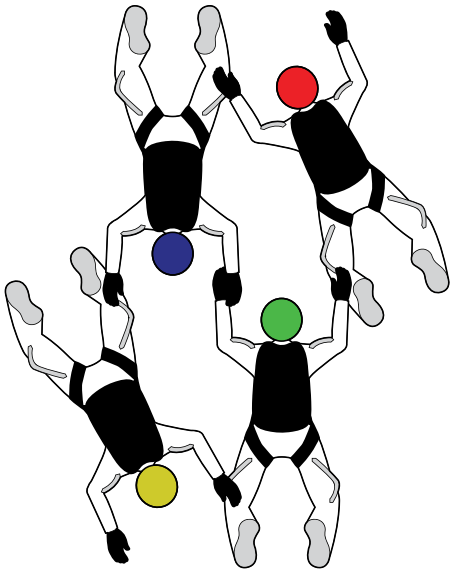

Figure 29: 4-Way Meeker Exit

The V person keys the launch. Immediately after the launch, all jumpers must present themselves to the relative wind and the step person picks up the left arm grip of the V person with their right hand, allowing the V person to drop the chest strap grip.

MARQUIS EXIT

The marquis exit is another step further in developing skills in exiting the first formation. The set-up for this exit places the person in the V on the aircraft side of the step person. They are side-by-side but facing in opposite directions.

- The wheel position (**POINT**) takes the normal position, well out along the strut.
- The step person (**OUTSIDE CENTRE**) follows the wheel person during the climb-out with the person in the V (**INSIDE CENTRE**) climbing out third.
  - As the step person moves out a little further than for the T-exit, the wheel takes a left hand grip on the step person's right leg (gripper).
    - The step person, when positioned as far out on the step as possible takes a right hand grip on the strut. With their left hand, they pick up the left leg gripper of the person in the V, as that person moves into position.
- The person in the V will pick up the left leg grip of the step person with their left hand after getting into position.
- Note: Check the positioning of these two arms. Be sure that they will not tangle or cross during the launch.

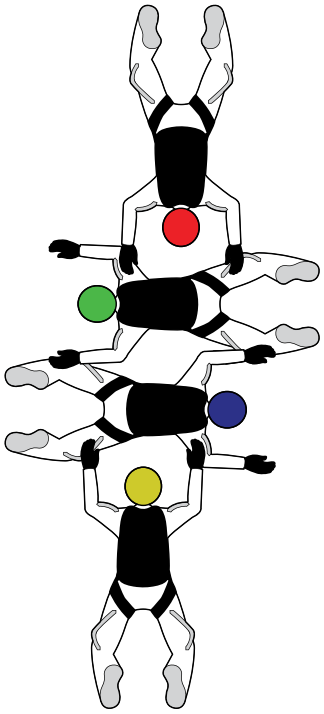

Figure 30: 4-Way Marquis Exit

The right hand can be placed on the strut, or the top of the doorframe. It is not used to pick up another grip.

The door person (**TAIL**) moves onto the step with their right foot and faces forward. They will grip the V person's right shoulder with their right hand. With their left hand, they can take a grip on the doorframe or pick up the right leg gripper of the person in the V. This grip is recommended only after your skydivers have acquired some experience with this exit.

The person in the V keys the launch. They will make eye contact with and nod (Ready) to the step person. They will both rock downwards (Set), then launch (Go) towards the aircraft tail. The person in the V is rotating head down; the step person is making a poised exit; the floater and inside persons are making 90° turns (not rolls) towards the centre while picking up the second grips.

▶ 4.11.1 SAFETY IN 4-WAY EXITS

- Team members should give each other gear checks; safety is everyone's business.
- Pre-exit, team members should gear check again.
- During the line-up to exit, protect handles and equipment.
- Before taking a larger group into the door, make sure you are aware of aircraft weight and CoG limitations. How many people are allowed in the back of the aircraft? Where is the "red line" where others must stay in front?

4.12 IN-FLIGHT TECHNICAL KNOWLEDGE

The five key points for a group exit are:

1. Balanced Set-up
2. Tightness
3. Timing
4. Presentation
5. Placement

1. A BALANCED SET-UP means that just prior to exit when everyone is in position, no one is off balance. Being off balance (falling off or tipping back into the aircraft) will greatly affect timing and placement. Being balanced allows everyone to go on "Go" and move to place themselves properly on the airflow.

2. TIGHTNESS refers to everyone being as close as possible on the exit. Of course being too tight can affect the exit negatively. Having heads together and grips pulled in close helps the tightness of the exit and can greatly improve the timing of the exit as well.

3. TIMING Getting everyone into the air at precisely the same time allows everyone to start freefall together. Timing means that everyone's downward acceleration begins at the same time. Most of the work in setting up an exit is directed towards ensuring that good timing occurs. Precise timing for individual jumpers depends entirely on their particular slot in the formation. Although all jumpers work with the same key/count, some may launch at a slightly different time (e.g. on "Set", or on the "G" of "Go").

Leaving the aircraft a fraction of a second late will cause separation. The acceleration due to gravity causes an object that leaves the aircraft to move downwards at an increasing speed until that object/person reaches its terminal velocity.

The person who begins freefalling just a fraction of a second ahead will be further away after each second, because the acceleration process started sooner. Only when the first skydiver's rate of acceleration nears terminal velocity after about 12 seconds will the distance between them begin to decrease.

FS groups use "drag-off" or linked exits to overcome differences in timing for the exit launch. If one group member is slow leaving the aircraft, they are pulled along with the group. Initially, you practised a free flown exit (No Grips) and the spaces, which were seen after the launch, were a result of the differences in timing of the launch.

Timing includes Audible, Tactile, and Visual references.

Audible—The count. Although some will not hear it, they may be able to see the mouth movements. This count helps with the cadence[13] of the launch.

Tactile or Feeling—The physical shake when ready, the swinging of the "count" leg or the Up-Down-Up motion mirroring the verbal count, all help to indicate the launch is happening. The person giving the count should remain until giving a strong shake for everyone around. Those waiting for the count should both watch and feel for the shake.

Visual or Watching—Watching for the shake will let you know when things are about to start. Being visually aware of either the leg swing or Up-Down-Up motion for the launch will keep you in time with the rest of the group.

4. **PRESENTATION** for exit is the fourth key point, both individually and as a group. Each individual must put their chest into the airflow, into the relative wind, regardless of positioning on or in the aircraft. It is the individual's job to ensure that they know how to move from the exit set-up through the launch into a "chest on the airflow" position, and at what angle.

   The group presentation is determined by the formation at exit launch. Point (front float) needs to jump up and Away from the centre of the formation. Tail (rear float) needs to jump down and away from the centre of the formation. Everyone should visualise the entire group at a 45° angle after the launch.

   The exits that are discussed in this manual highlight ways of positioning individuals on the strut and step so that the exit launch will result in a chest to the airflow position. The T-exit is a good example. It positions three individuals facing towards the airflow; all they do is step backwards and start flying.

   The fourth person is positioned with their back to the airflow; by rolling towards their front (the aircraft tail), they will achieve a head-down, chest on the airflow position.

5. **PLACEMENT** is determined by your slot in the formation. Your placement determines your timing and positioning at exit launch. You need to know where to place your body in relation to the others on the team.

13 Cadence: a balanced, rhythmic flow; a measure or beat of rhythmic movement.

To summarise, the key points for the exit in order of importance are:

1. Balanced Set-up
2. Tightness
3. Timing
4. Presentation
5. Placement

RESOURCES:

BASIC EXIT TECHNIQUES—JACK JEFFRIES, AVAILABLE AT:
DROPZONE.COM/SAFETY/DISCIPLINES/RELATIVE_WORK/BASIC_EXIT_TECHNIQUES_70.HTML

LAUNCHING A 2-WAY SIDEBODY PIECE, AVAILABLE AT:
PARACHUTISTONLINE.COM/COLUMNS/FOUNDATIONS-FLIGHT/LAUNCHING-2-WAY-SIDEBODY-PIECE

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PREVIOUS: SECTION 4 | Recreational In-Flight Skills

NEXT: SECTION 6 | Recreational Canopy Control Skills

5.1 INTRODUCTION

The PIM 2B and the skills grid take over where the PIM 2A and the Basic Skills Grid left off. They begin with individual manoeuvres and then look at small group flying skills and freestyle. Throughout, the focus is on an individual's actions, working in coordination with the other people in freefall.

5.2 ADVANCED SOLO MOVES

While you are waiting to find a suitable partner with whom to practise FS, the following advanced solo skills may be worked on to further improve body control and awareness.

These individual skills will refine the body's sense of balance and demonstrates maximum advantage for initiating individual moves. **These skills can use up a lot of altitude quickly, so maintain altitude awareness.**

IMPORTANT: FOR YOUR SAFETY, PLEASE CHECK WITH A COACH 2 OR RIGGER TO SEE IF YOUR CONTAINER/HARNESS SYSTEM IS APPROPRIATE FOR ANY OF THESE MANOEUVRES. USING THE INCORRECT TYPE OF GEAR COULD RESULT IN AN UNWANTED PREMATURE PILOT CHUTE DEPLOYMENT AND ENTANGLEMENT.

NEVER USE GEAR THAT IS NOT CLEARED FOR FREESTYLE MANOEUVRES.

5.2.1 BASIC ADVANCED MOVES

FRENCH ROLL

Unlike the traditional barrel roll, this manoeuvre does not create as much forward movement or head-down tilt. Learning to roll is a good way to introduce yourself to back flying, and to return to your belly from inverted flight. It is frequently used as a transition for back-to-belly freefly compulsory moves in competition.

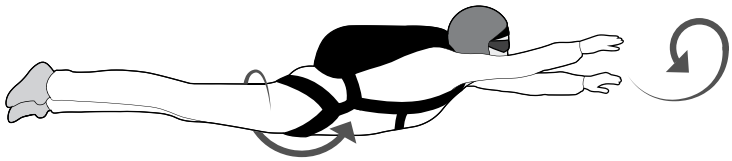

Figure 31: French Roll

Some people perform a roll during tracking to check the sky around them. However, this practice is greatly discouraged as you actually lose sight of your direction and heading if you are scanning, and because it is disorienting it is just not worth the risk. It is better to track fast and far and look around you in a forward orientation than waste time performing a manoeuvre.

When straightening your legs and pointing your toes, pretend to grab an imaginary ball on the horizon in a scooping motion, or, think of scooping ice cream. You should be able to pick a heading

and maintain sight during the entire 360° roll. While reaching for the imaginary ball, twist your shoulders in the direction you want to roll. For example, if you want to roll to the right, scoop the bottom of the imaginary ball with your right hand. Your left hand grabs the top of the imaginary ball. The faster you reach for the imaginary ball, the faster you will roll, because French Rolls are all about momentum.

As a twist to the twist, you can also initiate the roll using the feet instead of the arms.

STAND-UP

A stand-up in freefall is a body control skill. Mastery of this skill will lead to the starting position and balance needed for other skills such as freeflying. You should get coaching on the actions to achieve the stand-up. Because this is a high-speed move, safety considerations include thorough gear checks, and gear that is compatible with a high-speed stand up freefall. Performing this move in close proximity with another skydiver at high speed can result in a fatal collision.

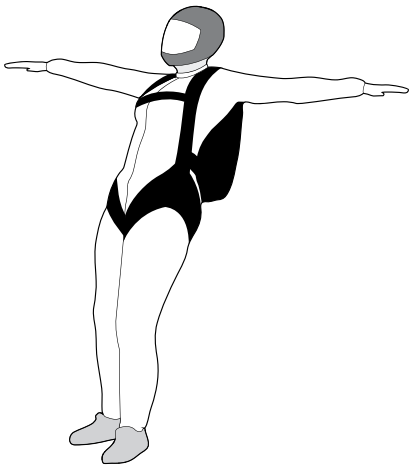

Figure 32: Stand-Up

Starting from the box position, draw the knees up to attain a head-high position and bring the legs tight together. The arms should be extended symmetrically from the sides slightly in front of the torso, level with the shoulders, and the hands are palms down. With toes pulled upward, heels down, the legs are straightened to extend downward, resulting in a stable standing position. From this position, turns can be executed by tilting the palms of the hands or offsetting the arm levels, back loops by lifting the knees to the sitting position, and front loops by breaking at the waist and diving into the rotation.

Start from a sit fly position by pushing the heels down, bring the knees tight together, and straighten the legs.

FASTFALL TUCK

The objective for this body control skill is to perform a controlled freefall jump in a tucked position. The fastfall tuck is the least stable of the freefall body positions, but allows for rapid turns and is the position used for classic competitive style.

Begin in a relaxed stable spread. Quickly draw the knees up towards the chest and at the same time bring the upper arms to the sides. You will have to counter the shift to a head high position by pushing the chest down, while keeping the back straight and the shoulders arched (i.e. not cupped).

Once the tuck is initiated, you should try to draw the knees in against the hollows of the shoulders (collarbones), while forcing the chest down against the thighs and the heels up against the backs of the legs. The toes are pointed and the leg muscles are tensed. Note: With the legs up against the torso, the relative wind will help to keep them in place.

Figure 33: Style Tuck

The lower arms remain at right angles to the torso, extending to the sides at waist level to assist with balance. The hands are carried slightly below the plane of the body into the relative wind, palms down with the fingers spread.

Moving the hands back will pitch the jumper's head down and conversely, moving them forward will cause a head high attitude. The back should be kept as straight as possible, with the chest remaining close to or touching the thighs.

The transition into the fast fall tuck must be done symmetrically. It will probably take you several attempts to maintain a balanced fastfall position. Some key tips are to keep the head down to keep the target in sight and to place the hands symmetrically alongside of the center of the body (waist/knees). Hold the position stable for 10-15 seconds in order to achieve maximum freefall speed, especially if attempting a style series.

▶ 5.2.2 BACK FLYING (INVERTED FLIGHT)

The sport of skydiving is constantly evolving. Skydivers now enjoy relative work when belly flying, sit flying, and when head down. This section provides athletes with an outline of the basic skills required for freestyle vertical skydiving, or freeflying. The suggested progressions use the back position ("back flying") and sit position as the base of freeflying and a programme is outlined in which controlled manoeuvres about all the axes are developed. The skills and techniques required for head down freeflying are discussed in a separate section of this manual.

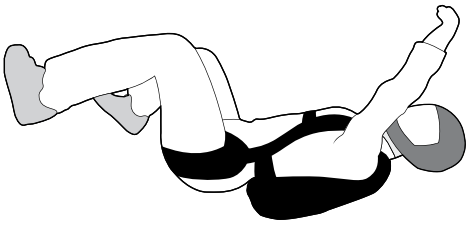

Figure 34: Back Flying

Further information can be found in **Section 5: Introduction to Freeflying—Sit Flying in PIM 2C**.

This is the term used to describe the skill of flying in a back to earth attitude or face up position. It is a lot of fun and is an introduction to the art of freeflying later on. The back to earth attitude can be achieved by simply rolling ½ barrel roll or ½ of a loop (front or back). You can adjust your position to fall slowly like a belly flier, quickly with head down, and backtrack. A wide stance and upward curved body is the position for a stable freefall. Turns, forward movement, etc. are achieved in the same way that they are achieved in a face to earth freefall. You may want to go out alone to practise this skill.

To back fly, lay on the floor as if you are laying on your back. Let the wind blow your arms up toward the sky. Let the heels raise up with knees bent. This will give you a fast fall rate. To slow down, flatten the arms far out to the sides and extend the legs out with knees and hips slightly bent.

Once you have tried it a couple of times, you may want to try inverted turns: simply rotate the hands for a slow turn or the knees for a much quicker turn. Inverted turns are initiated from the inverted position. The turn can be achieved by deflecting air with the arms, legs or both. The opposite move is used to stop the turn. Placing one foot on the inside of the opposite knee is a popular way to initiate a turn and switching to counter the turn. Be creative and try other ways too.

RESOURCES:

PREVIEW OF THE DVD "LEARNING TO FREEFLY BACKFLY", AVAILABLE AT:
YOUTUBE.COM/WATCH?V=F8NKMROADWG

BEGINNING FREEFLYING, AVAILABLE AT:
DROPZONE.COM/SAFETY/DISCIPLINES/FREEFLYING/BEGINNING_FREEFLYING_558.HTML

THE STARTING POINT

The recommendations prior to initiating freeflying are:

- Get a Coach 2 who is competent in freeflying
- B-CoP minimum
- Minimum of 75 freefall skydives or tunnel time recommended
- Be able to maintain control of your body position during front loops, back loops, and barrel rolls
- Performed a sit or an inverted 360° figure 8
- Be able to perform a stand up and hold it for 5 seconds

Although an athlete with an A-CoP could start freeflying, without a solid base in the skills listed above they will find the manoeuvres challenging… and expensive to practise alone. Developing good basic flying skills first will accelerate your progression when you start to work on back/sit/freeflying. It is also recommended that athletes who wish to concentrate on freeflying purchase an audible altimeter as a secondary backup to a wrist altimeter.

PREPARATION SKILLS

Similar to belly flyers, freeflyers must use mental imagery and relaxation techniques. In freefall, you must be alert yet relaxed and ensure that you maintain altitude awareness. It is important to be both physically strong and flexible. Strength is required because effective body positions and flying attitudes must be maintained at a rapid fall rate. Flexibility maximises stability and increases the range of movement.

IN-FLIGHT

EXIT ORDER:

The exit order must allow for adequate horizontal separation between groups. Freeflyers have a significantly higher fall rate and are affected differently by forward throw from the aircraft. The general rule is that freeflyers exit following the belly flyers, and larger groups exit before smaller groups.

THE SIT EXIT POSITION:

To exit a Cessna aircraft, crouch on the step or wheel facing the tail of the aircraft. You should lean slightly forward, position your back to the relative wind (facing away from the line of flight) with your hips locked in the sitting position, arms out to the side, right hand balancing on the doorframe, and left hand on the strut. Your knees should be approximately shoulder width apart and your legs bent. This exit position allows rapid transition into the vertical sit position.

RESOURCES:

LINE OF FLIGHT EXPLAINED, AVAILABLE AT:
DROPZONE.COM/SAFETY/GENERAL_SAFETY/LINE_OF_FLIGHT_EXPLAINED_894.HTML

▶ 5.2.3 SIT POSITION AND HEADING CONTROL

The sit position is the basis for freeflying because it is natural, allows for maximum visibility, while fall rate and directional movements are controllable. In fact: **learning to maintain the stable sit position with a constant fall rate is the most important task when learning to freefly**.

The sit position illustrated here is the same for everyone with only minor variations due to body shape, size, and distribution of mass.

To get an idea of the basic sit position, sit in an erect armchair and then lift your arms (palms down), elbows bent 90°, hands roughly in front of you.

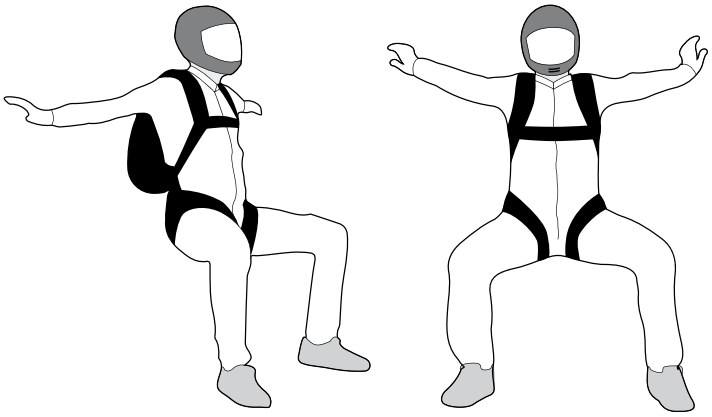

Figure 35: Sit Flying

HEADING CONTROL:

New sit fliers should remember to choose a heading perpendicular (90°) to the line of flight. This avoids movement that may put you into contact with other jumpers on the same pass.

TRANSITION TO THE SIT POSITION:

The transition into the sit position can be effectively achieved from the back (inverted flight). To transition from the back to the sit, spread your arms wide with palms down, position your legs at 90° about shoulder-width apart (similar to sitting in a chair laying on its back). In one rapid motion, push your legs down as if getting up out of a chair, while bending forward at the waist. Pull your arms into your body and, in one sweeping motion, thrust your arms forward (hands open and palms facing out) away from your chest and pull air towards the body. If unstable, simply return to the back, relax and check your altimeter, and try again if altitude permits.

OBSERVATIONS/SENSATIONS FROM THE SIT POSITION:

- Compared to belly flying, there is a higher wind force and sound from the higher airspeed.
- You will find that there is little wind hitting your torso or face.

When performing a stable sit, you should keep your shoulders square, level and have a balanced body position. This will best help you to remain on heading and prevent orbiting.

ADDITIONAL POINTS TO MAXIMISE STABILITY INCLUDE:

- A wider leg position provides more stability.
- Heading can be maintained by keeping your arms and legs symmetrical and balanced.
- Your arms should be directly extended from the torso with your hands open and facing down.

- Your feet should be flat and into the relative wind.
- Maintain a flexible 90-degree angle between your feet, calves, thighs, and torso.
- Do not arch. Maintain a straight back with your head up, looking straight at the horizon.

In sit flying, there is a tendency to backslide. It is important to develop a sense for airflow on the back instead of the chest. It is especially important when practising sit flying as the tendency to reach for a grip will cause the opposite of the desired effect resulting in increased separation from the target.

The sit position is the primary set up for the execution of turns and loops and this position must be mastered prior to progressing to turns. When in the sit position, always assess your heading control and perform frequent and quick altimeter checks by turning the head slightly towards the altimeter with minimal body adjustments or this can drastically affect the fall rate.

INVERTED TURNS:

While learning to sit fly effectively, jumpers should experiment with various turning techniques and observe the resulting effect on stability, airflow, and speed of rotation. Suggested turning techniques with resulting motions include:

- Extend a leg—you will turn backwards around the other leg.
- Pull in a leg—you will turn forward around that leg.
- Extend an arm—you will turn backwards around your feet towards the other arm.
- Pull in an arm—you will turn around your feet towards that arm.

On each jump, use the same technique to turn more than once before moving on to other methods. Focus on learning how to do each type of turn before attempting combinations. You should remember to use a consistent fall rate while smoothly performing turns and figure 8's.

BACK LOOPS:

- Starting from the sit position, straighten your legs and lean backwards.
- Once upside down (inverted or head to earth), pull your knees to the chest to reduce the resistance to the airflow. To maintain directional stability it helps to hold a square body position with your arms wide and hands open. Execute the leg movement as rapidly as possible.
- About three quarters of the way through the loop, spread out into the sit position.

*The key to a successful loop is to make the entire motion as rapidly as possible, so that you do not change your fall rate.

FRONT LOOPS:

- Starting with the sit position, extend your legs down, as if to stand, and bend forward at the waist.
- To maintain directional stability, hold a square body position with your arms wide and hands open. Execute the leg movement as rapidly as possible.
- Approximately three quarters of the way through the loop, spread out into the sit position.

INVERTED FORWARD & BACKWARD MOVEMENT

The execution of controlled forward and backward movement while maintaining a level and consistent fall rate in the sit position are key skills for effective freeflying VFS. After mastering turns and loops, you should seek out a coach who is proficient in sit flying to work on relative sit flying skills. Start with 1:1 jumps before moving on to group sit flying. Proficient sit flying is defined as the ability to maintain position and perform all basic skills including turns, loops, docking, levels, and transitions. Working with a coach is the best way to assess your range of motion and relativity. You should speak with the Drop Zone Safety Officer to suggest a coach with sufficient skills.

Note: As a general rule, when working on 1:1 relative skills as a sit flyer, utilise proximity and break-off procedures as outlined in the PIM 2B (Section 5.5). Set up approximately 6 metres, at the same level and directly in front of the coach, prior to initiating any movement. To start, you should aim at staying about 2-3 metres in front of the coach (the approach zone) until proficient and comfortable with the countering motion. Actual docking in the sitting position should not be attempted until you are proficient at controlling forward and backward motion, while maintaining heading and relativity.

FORWARD MOVEMENT:

The principle of start—coast—stop can be applied to forward and backward movement. Apply the initiation action (Start). Once the manoeuvre is initiated, move to a neutral position (Coast), and then perform the counter manoeuvre (Stop).

Start—Initiate forward movement from the sit position by extending your legs slightly forward below the knees. (As you progress and gain experience, various positions of knee width and hip position can be attempted for stability, effect, and range.) With your legs extending forward, lean back at the waist with your arms back slightly (palms down) to maintain balance. Maintain an upright head position and eye contact with the target. (Hint: while sit flying, it is important to keep in mind that to move closer to a target, you must lean away, as if reclining a chair, as this creates airflow on your back that pushes you forwards.)

Coast—Upon reaching the proximity zone, level out approximately 2 metres away from the target (the edge of the approach zone), and return to the sit or neutral position. Forward momentum will keep you moving forward.

Stop—Stopping or countering the forward motion can be achieved by leaning forward slightly while moving the feet back under the body (again utilizing the opposite motion to move in the intended direction).

BACKWARD MOVEMENT:

Start—To initiate backward movement, set-up approximately 6 metres from the target and, from the sit position, lean forward. Keep your arms level or slightly forward (palms down) to maintain balance. Keep an upright head position and maintain eye contact with the target. Move the legs under the body to roughly a 45° angle.

Coast—Once approximately 8-10 metres away from the target, return to the sit or neutral position. Backward momentum will keep you moving slowly away.

Stop—Stopping or countering the backward motion can be achieved by leaning backward slightly while moving your feet away from your body.

LEVEL CONTROL

With the high rate of fall attained during freeflying, even slight differences in fall rate can cause significant vertical separation. Developing the ability to control level rapidly (vertical separation) is a key freefly VFS skill.

INCREASING VERTICAL FALL RATE:

There are two different methods to increase the fall rate so that you can close a vertical gap. The positions are the stand-up and a compressed sitting position. Both involve streamlining the body or presenting a smaller surface to the relative wind, thereby increasing the fall rate. Because of the high speed, the stand-up is used to cover large vertical separation. The compressed position is most effective for closing smaller vertical separation. When freeflying, it is very important to be aware of other jumpers above and below you. You should develop the normal habit of scanning 360° below you before increasing the fall rate.

STAND-UP POSITION:

- From the sit position, keep your back straight, arms out (palms down) and look at the target below. For maximum stability, feet should be shoulder width apart and flat.

- Maintain an erect body position until 2-3 metres above and in front of the target.
- To counter the stand-up, you need to increase the amount of surface presented to the relative wind. In one motion, while maintaining stability, bend the waist and bring your knees back into the sit position. Keep in mind that the knees must be spread out approximately shoulder width and the arms slightly backwards.

COMPRESSED SITTING POSITION:

- To compress the sit to generate a small increase in fall rate, you will pull your feet in under your body while leaning slightly forward. Your head should remain upright while maintaining eye contact with the target. The arms can be pulled towards the body and adjusted backwards to maintain a vertical falling angle.
- Maintain the compressed body position until you have almost closed the desired distance to the target.
- To stop return to the basic sit position.

DECREASING VERTICAL FALL RATE:

In the event of falling low on the target, you will need to learn to slow your rate of fall while in the sit position. A general rule of thumb during all group freeflying is to use the low person in the group as the base. It is important that if you decide to reduce the rate of fall, you should not be directly under another jumper. Rapidly decreasing the rate of fall is called "corking" and is highly dangerous. You should develop the habit of scanning 360° above before decreasing your fall rate.

- To slow down the fall rate you will need to achieve a reverse arch. In one motion, retaining as much balance as possible, you should lift your hips, kick the legs out evenly, and lean backwards. The arms should remain out with palms down. Remember to maintain eye contact with the intended target.
- To stop, return to the basic sit position.

CORKING:

Corking is a term used mostly by freeflyers to refer to someone that has gone unstable and returning to belly-to-earth. Returning to back flying is the preferred option instead of going to belly. Going unstable while freeflying causes a person to very quickly slow down and therefore go up relative to the rest of the group. If this person was below you at the time he or she corked, you would be in **-serious-** danger of a mid-air collision. Corking is **NOT** a good thing, as you will rapidly decrease speed from approximately 160 mph to 120 mph.

ANGULAR & DIAGONAL MOVEMENT:

While practising VFS sit flying, you will need to complete a dock by moving forward or backward on an angle (diagonal movement).

- To initiate diagonal movement from the sit position, maintain the position of the upper body (straight back, head up and arms out), and drop the leg in the direction of the intended target. For example, to move to the right (45°), you should drop the right leg lower than the left leg and slightly raise the hips. You need to practise the finesse of this manoeuvre by experimenting with different leg positions. If you wish to move down and to the right, then a deeper drop of the right leg is required.
- To stop, return to the basic sit position.

CART WHEELS/TRANSITIONS:

Executing a flawless cartwheel is a key step before transitioning to the advanced freefly skill of head down. To maintain a balanced body position during a transition, the manoeuvre must be completed as rapidly as possible. At all times, the jumper needs to maintain a consistent fall rate and remain in position and on heading. As previously stated, corking while close to another skydiver is extremely dangerous.

- In one rapid motion, pull in the right side of the body tightly against the torso. The right arm should be aggressively bent and pushed down to the right side of the torso and the right leg bent at the knee with the right foot tucked up as high as it will go. The left arm should be raised to catch air while the left leg remains in the standard sit fly position.
- If performing a complete 360° transition back to a sit, you should remain in the tuck until ½ to ¾ through the rotation. The rotation is extremely rapid and momentum should carry you back to the sit. It is critical to maintain a stable head position and balanced shoulders (no dipping forward or leaning back) or the rotation will move forward or backwards.
- To stop, return to a balanced sit position.

DOCKING:

It is very important to maintain a consistent rate of fall while executing docking manoeuvres. As previously mentioned it is especially critical to avoid corking while flying close to other skydivers. You should be extra cautious to avoid reaching, leaning or stretching to complete any docking manoeuvre as the change in airflow can have a drastic effect on the fall rate creating a dangerous situation. Only minor adjustments should be attempted when flying in close proximity to other jumpers. Docking can be performed in any combination with feet or hands.

5.3 CLOSING LONG DISTANCES IN FORMATION SKYDIVING

Before attempting the FS swoop or docking long distances, there are additional terms, concepts, and information that you must know.

Quadrants—Quadrants are areas in the sky that are split into four equal portions of 90 degrees. Each skydiver is assigned a quadrant. Going to your quadrant early or high up and staying there can prevent the possibility of freefall collisions. If low, go further out into your quadrant, come up and above, and try another approach, still in your quadrant. Everyone should break-off and track in his or her quadrants as well.

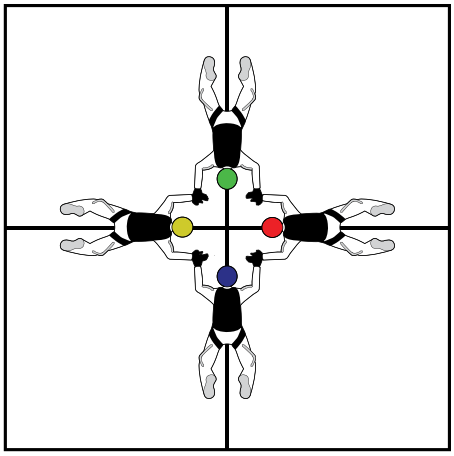

Figure 36: Quadrants

Dive—A verb to describe the action of performing a high angle approach to get on the same level as the base. Diving involves steep vertical motion used to close vertical distances rapidly. Care should be exercised; always look where you are going. High closing speeds experienced in these positions demand caution in their use.

Diver—A diver is a jumper who exits after the base and utilises a "dive" to approach the base.

Approach Angles & Speeds—This applies to the speed and angle that you have in relation to the formation. This will determine whether you will need to make your dive steeper or shallower to get to the formation. Use your legs to maintain directional control on your approach and make it as smooth as possible. Use the start–coast–stop principle.

Start–Coast–Stop (SCS)—Is a control method to smoothly approach a formation or execute a sequence involving significant movement (180° and 360° turns). The start phase is the initiation, the coast phase is returning to the box to assess your approach speed and angle, and the stop phase is the countering action. When approaching a formation, the application of SCS will enable the skydiver to reach the final approach zone smoothly and safely.

When learning to dive the SCS can be applied in a series of start, coast, start, coast, actions to produce a stair-step approach to the formation. This allows further control, prevents over-swooping the formation, and helps to gauge progress while learning how to dive. When learning it is also a good practice to dive to the side of your target, while remaining in your quadrant, in case you cannot stop in time.

Flaring Out—The technique for slowing down an approach is to backslide and/or reverse arch. The extent of the backslide and/or reverse arch will depend on the approach angle and forward

speed. The faster the forward speed, the more backslide is required to stop the horizontal motion; the higher the angle of approach the more reverse arch required to stop vertical movement. It works most effectively if you can place your torso perpendicular to the relative wind caused from your dive.

Docking Procedure—The procedure for docking on a base is as follows: Head for your quadrant high and/or early. Approach facing your slot and test the fall rate. Stop just outside, or in your slot, and fly with no contact with the formation. Take your proper grips in a manner that does not disturb the formation. This procedure is for both divers and floaters. Remember to demonstrate CONTROL at all times!

Long Swoop—The objective of the FS swoop is to close a large vertical and horizontal distance to an FS group that is below you. The skill incorporates a high-speed dive with a transition to a slow-speed approach and smooth contact with the formation. (Note: This should only be attempted after you have developed proficiency with entering fourth from a tight exit.)

The long swoop is normally set up from a delayed exit. Delay your exit for about 1 second. Do a dive exit to delta during the fly away from the aircraft. Attain a dive and about 10 to 20 metres out and 5 to 10 metres up from the group stop and test the fall rate, setup, and dock. In larger groups follow the traffic flow and be in your quadrant on time and on level. Continue the approach as you did in the FS dock exercise. Stop the downward and forward motion as you arrive just outside the formation. Be level and stopped before you dock.

You can be introduced to this skill when you are doing 4-way games and exercises. Start by exiting 1 second after the group and progress to 2 and 3 seconds. Longer delays create extremely large distances requiring higher altitudes and more experience. The three others will exit and make a star or line, with an open slot facing towards the person performing the swoop (aircraft heading).

It is best to learn the long swoop on a 2-way. Practise it more on 3-way and 4-way. You will have already mastered it when you try your first 10 way! Be careful regarding possible high closing speeds. Do not use your fellow skydivers as brakes. If necessary turn to the side of a formation to bleed off excess airspeed and watch out for others approaching from the other quadrants you have just entered!

Note: Only have one skydiver perform this skill on any one jump, as two or three skydivers learning how to swoop at the same time could be dangerous due to the chance of collision.

Recovery—Recovery is something you have to do when you end up low in relation to the base. This can occur for many reasons including an over swoop, a funnel or a slow fall rate of the base. To recover, you need to use the best reverse arch position that you can obtain. Turn 90 degrees to the formation and lower your head as well to get the maximum cup. Keep your head down, but

turned to the side as this allows you to see the formation. Rise up to a position at least 3 metres above the formation while remaining in your quadrant. Once above, monitor the levels and attempt to re-dock. Good recovery allows you to be in the formation!

FLOATER TRACKING:

The objective of floater tracking is to close a large vertical and horizontal distance to an FS group that is above you. The skill incorporates a high-speed floater track with a transition to a slow-speed approach and smooth contact with the formation.

Note: Again, this should only be attempted after you have developed proficiency with entering fourth from a tight exit (proficiency means consistent at docking in less than 15 seconds on tight free-flown exits). Remember quadrants, approach angles and speeds, start–coast–stop, flaring out, the fall rate test, and the docking procedure.

Before attempting the floater track, there are some additional terms to know:

Float—A verb to describe the action of performing a low-to-level approach to dock on a base.

Floater—The floater exits the aircraft before the base and may utilise a track or delta to fly or float up to the base. They must use a slow fall rate to get up to the base. Floating also refers to an exit position outside the airplane (e.g. front float or rear float).

Dive Floater—The dive floater dives out of the aircraft before the base launches, turns 180 degrees, and then utilises the floater track to fly up to the base. This only occurs in very large formations.

The floater track is normally set up when exiting early in relation to the base. Leave about 1 second early. Do a floater track exit from the aircraft and fly to a place about 6 metres out and 3 metres feet up on the formation. Apply SCS, stopping early to test the fall rate. Now continue the approach as you did in the FS down dock exercise. Stop the downward and forward motion as you arrive just outside the formation. Be level and stopped when you dock.

You can be introduced to this skill when you are doing 4-way games and exercises. Start by exiting 1 second before the group and progress to 2 and 3 seconds. Longer delays create extremely large vertical distances requiring higher altitudes and more experience. It is best if the other three skydivers exit and perform one or two formations and set a good rate of fall. They will then make a star or line maintaining an open slot facing you to allow you to perform the floater track (opposite aircraft heading). Practise first by exiting into your quadrant and doing the floater track to dock. Later, practise by exiting and having to floater track to a different quadrant, and dock. It is best to learn the floater track on 2-ways. Practise it more on 3-ways and 4-ways. You will have already mastered it when you try your first 10-way!

DIVE:

The term "dive" is used to cover a variety of positions that produce a head-down attitude with an increased airspeed. There are three types of dive or dive-combination:

- Down & forward: Delta Dive
- Straight down: Max Dive
- Down & back (back track): No Lift Dive

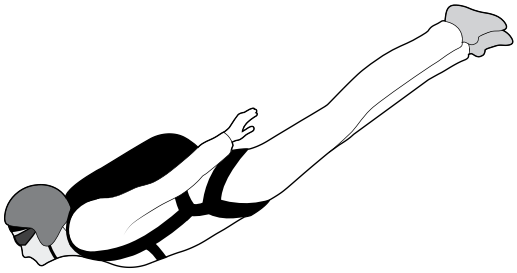

Figure 37: Delta Dive

Delta Dive—From the basic delta position, the body can be streamlined further until the downward motion becomes more prominent than forward motion. When streamlined fully the dive is a very effective way of losing altitude while maintaining eye contact with the base.

To do a delta dive the steps are:

1. Extend the legs fully; locking the knees while smoothly sweeping the arms back.
2. Press the chest forward, as though the chest is leading.
3. Sweep the arms back as close to the sides as comfortable. Simultaneously narrow the legs to shoulder width.

Getting too narrow can affect your control of direction. It is important to maintain directional control over speed. To trim the angle further, arch the upper spine as far as comfortable. Push the head back towards the reserve container. The transition should be done smoothly and symmetrically. Streamlining of the delta dive occurs as you become competent and comfortable with the position. Remember that eye contact and directional control are the most important factor from a safety point of view.

The delta dive position has a range of motion that extends from a slow forward speed and moderate increase in fall rate to a near vertical dive (slight horizontal speed), depending on arm, leg, and head positioning. The more streamlined the body is the quicker and steeper the angle. **High closing speeds experienced in these positions demand caution in their use.**

Max Dive—The max dive is a further extension from the delta dive. In this case, the objective is to go straight down with no horizontal speed (forward or back). To enter a max dive transition from a full delta dive position fully streamline yourself, straighten the upper spine, keep your head tilted back just enough to maintain visual contact with other divers and the base. The arms can be brought in tighter to your sides. The legs are brought together (about 15-30 cm apart).

These are some modifications to the max position that may help you master the initial dive. They are:

- Putting the feet into a flat (flexed) position (rather than toes pointed) to act as rudders.
- Sweeping the arms slightly behind the plane of the torso will keep the head raised a bit more.
- Keep the head straight, but look out from the top of your eyes.

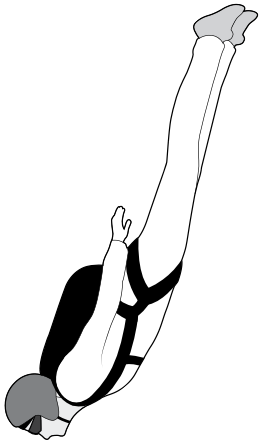

Figure 38: Max Dive

No-Lift Dive—(aka Vertical Dive) A no-lift dive is a back-tracking dive. It is done by extending a full track position to the point that the body changes suddenly from a horizontal attitude to a very steep vertical attitude; it creates minimum lift as it has a very low angle of attack in relation to the relative air. Being head down feels unusual at first.

Safety is paramount with this move. Handles, Velcro or flaps, the pilot chute handle and pouch all need to be in proper working condition and configuration for this type of jump. Using the wrong equipment could have dire results. In addition, altimeters and AAD's can be caught in a burble and not function properly due to altimeter lag.

The steps to do a no-lift dive are:

1. Start from a dive exit, then push the arms back into the "track" position.
2. To complete initiation, roll the head forward towards the chest until the body flips into a vertical position. The legs should remain fully extended. Once the vertical attitude is attained, a sensation of the body continuing over on its back will be experienced. This feeling is strange, but correct.
3. To counter, roll the head back and spread the body into an arch, flaring for several seconds (see backslide).

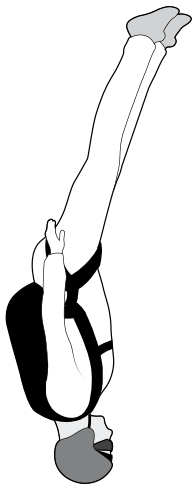

Figure 39: No-Lift Dive

CAUTION: *The no-lift dive should not be used during FS jumps because it is difficult, or impossible, to maintain eye contact with the formation, which can be dangerous. It also causes you to back track from the formation giving you more horizontal distance than you first had to close. This type of dive is used for building up speed to do style at an advanced level.*

All of the various dive forms, with the exception of the no-lift dive, are effective for the many diving situations that will occur while doing FS. It will be up to you to "read the play" in the air and chose the correct form to match the situation. This all improves as you gain FS experience.

5.4 FORMATION SKYDIVING: GROUP ENDORSEMENT TRAINING

Formation Skydiving is one of the more enjoyable activities related to sport parachuting. It offers horizons limited only by the parachutist's skill, imagination, and enthusiasm. Formation Skydiving may be described as the intentional manoeuvring of two or more skydivers in close proximity and relative to one another, with or without contact, during freefall. Formation Skydiving is incorporated into the national and international competition events of 4- and 8-way Formation Skydiving (today commonly referred to as "FS", formerly known as relative work "RW").

Poor training, lack of caution, and/or poor preparation can make Formation Skydiving quite a hazardous undertaking. The very concept of Formation Skydiving is the smooth flow of two or more jumpers in aerial harmony. Mid-air collisions, wrestling for positions, and sudden break-offs are frowned upon and can be quite dangerous. The collision of two bodies in flight can cause severe injuries or death.

CAUTION: *The greatest danger in Formation Skydiving exists when jumpers:*

- *Lose sight of one another,*
- *Approach a formation at high speed without adequate control, or*
- *Open their parachutes without adequate separation, visual checks, or signals.*

This section outlines further procedures, skills, and knowledge that experienced Formation Skydivers have determined to be the most efficient method of learning to participate in Formation Skydiving safely. While learning Formation Skydiving, you will follow a progression of exercises to develop your Formation Skydiving skills.

To review, to achieve the A-CoP you must have completed the **2-way FS Endorsement**. Once you are certified as an A-CoP, you may:

- Participate in 2-way 1:1 belly relative work
- with a B-CoP holder, experienced in relative work, who has at least 100 jumps, and
- **with the approval of a Coach 2.**

TIP: A-COP 2-WAY ENDORSEMENT

*NEW AS OF 2014—**PIM 1**: WITH AN ADDITIONAL THREE JUMPS, COACHED BY A COACH 2, A-COP HOLDERS MAY JUMP WITH ANOTHER A-COP HOLDER WHO ALSO HAS THE ADDITIONAL THREE COACHED JUMPS. BOTH MUST DEMONSTRATE SAFE SEPARATION AND APPROACHES, AND HAVE COACH 2 APPROVAL FOR EACH JUMP. SEE PIM 1 FOR OFFICIAL DETAILS.

This system allows the A-CoP holder to practise the skills learned during the 2-way FS endorsement with another competent participant. The 2-Way endorsement is described in **PIM 2A**.

RESOURCES:
THE FORMATION SKYDIVING (FS) ENDORSEMENTS, AVAILABLE AT:
CSPA.CA/EN/LEARN-SKYDIVE/ENDORSEMENTS/2-WAY-FS

REMEMBER: ***PIM 1*** *BSR #1: §2.1—No parachutist shall engage in parachuting activities or use parachuting equipment unless trained and endorsed, if required, for the same.*

The 2-way FS endorsement requires a minimum of 5 evaluation jumps following the training jumps with a Coach 2. The end goal is that the novice skydiver can perform the following in a 2-way formation skydive safely:

GET THERE → STAY THERE → GET AWAY!

The following section covers the Group FS Endorsement and Technical Knowledge.

PREREQUISITES FOR GROUP FS ENDORSEMENT: REVIEW

Prior to beginning the Group FS endorsement, you must have successfully passed the 1-on-1 FS training with a Coach 2 and must be in possession of the A-CoP. You should be able to exit stable in a variety of positions on your own, demonstrate a stable body position in either Box or Mantis position, good recall and awareness, altitude awareness, forward movement (leading to the Track), rear-riser control and landing accuracy.

The progression stages shown in the Recreational Skills Grid should have at least two jumps per stage to learn the skills adequately. A Coach 2 will assist you to become endorsed in 2-way Formation Skydiving.

Note: The ability to Track is not a requirement for the A-CoP 2-way endorsement, but it is required for the B-CoP. You should cup, turn 180° from the centre and move away as far as possible until pull

time. Start good habits from the very beginning. Your coach may advance you to learning the track as your skills permit.

The following important new skills were presented during 1:1 FS training:

- Level control: up and down motion
- Proximity: forward and backward movement
- Break-off procedures
- Learning to track
- FS signals

▶ 5.4.1 EVALUATION—FORMATION SKYDIVING

TO COMPLETE THE GROUP FS ENDORSEMENT

Certification of the Group FS Endorsement is an extension of the 2-way Endorsement, and must be taught by a Coach 2. Prior to the participating in Group FS you must hold the B-CoP, which means not only this Group FS Endorsement, but also other practical requirements and written examinations.

To complete the Group FS Endorsement, you require the following:

The novice must perform a minimum of fifteen 2-way practice skydives "since obtaining the A-CoP". These jumps can be with either a Coach 2, or a Coach 2 approved B-CoP holder; the B-CoP holder must be both proficient enough in their own FS flying ability and safety to be of benefit to help the novice to improve. This approval is jump specific and for a learning/training skydive and not just a "fun skydive".

The dropzone should have a 10 jump programme for the development of a novice's FS skills. This may consist of a minimum of 10 practice jumps prior to beginning evaluation, or spread out every five or six jumps and then a progressive evaluation with a Coach 2.

The Group Freefall Endorsement evaluation consists of a **minimum** of three evaluation skydives (typically more are required) during which time the Coach 2 evaluates and makes recommendations for improvement to the novice in the following areas:

- Calculation and execution of:
  - Climbout spot, prior to exit
  - Exit spot, and
  - Opening spot (from the ground up)

- Free-flown exit (no grips) followed by an approach to a dock:
  - The final evaluation jump should be a 2 second delay on exit
  - Closing vertical and horizontal separation; clean dive-to-delta
- Proximity maintenance throughout the skydive, controlled by the novice
- A flat track adequate for separation from a 4-way, with minimal vertical altitude loss during the horizontal track
- An opening avoidance drill under canopy; must be clearly practised and demonstrated (may be performed any time with a C2)
- A canopy dive recovery drill (may be performed any time with a C2)
- Awareness and control during final canopy approach
- Accuracy

As a Solo CoP skydiver working on the 2-way endorsement, the Coach provided a lot of correction to freefall levels and proximity. Now, the novice has to adjust his/her level and proximity to match the partner or the Coach 2, and then dock. Emphasis is on matching levels prior to docking.

Recommendations are listed below. The most important thing is that the final evaluation is thorough and consistent. The Coach 2 should help plan the first four or five skydives (of the 15) where specific drills are practised, such as turn types, prior to the first evaluation skydive.

PRACTICAL SKILLS:

Your practical skills will be evaluated on a checkout jump similar to the ones listed below. The skills must be performed to an efficiency of at least 80%.

1. Demonstrates ground preparation and basic safety routines.
2. Demonstrates proper exit procedures and exits free-flown (no grip) with good timing and placement on the airflow (stability).
3. Demonstrates directional control in freefall and completes a minimum of 3 properly executed pins from 9500' AGL on the same dive.
4. Demonstrates altitude awareness by completing the correct break-off procedure with stable activation at the required altitude. (Automatic repeat if not performed correctly).
5. Demonstrates canopy control collision avoidance techniques and traffic awareness.
6. Demonstrates awareness of the entire jump and documents it (logbook) with accuracy and completeness.

RESOURCES:
THE FORMATION SKYDIVING (FS) ENDORSEMENTS, AVAILABLE AT:
CSPA.CA/EN/GROUP-FORMATION-SKYDIVING

EVALUATION JUMP 1: PARTNER SEQUENTIAL

(Can be repeated as necessary.)

SKILLS TO BE PERFORMED:

- Exit: ½ second delay, short delta dive
- Boxman position
- Docking (open-handed, not closed grip)
- Turns (3 turn types over several Drill Dives leading up to the first Evaluation jump, including levels and proximity)
- Communication
- Proximity maintenance during "dock"

BREAK-OFF-AND-TRACK (BOAT):

(This assumes the Track has already had one entire training dive dedicated to it.) Allow plenty of time for a full 5-second track, while still flaring out and deploying by 3000+ feet minimum. Start higher.

PASS CRITERIA:

- Smooth, controlled execution of the proper movements or action; quality is more important \ than the number of repetitions.
- Solid flying to the formation is more important than reaching for a grip.
- Positioned in front of partner, maintain levels and proximity during turns.

Following this first evaluation jump, the Coach 2 should provide specific recommendations and remedies in order to aid the novice in their progression. The schedule for the next four to five skydives should be well laid out.

EVALUATION JUMP 2: SIDEWAYS MOVEMENT

(Can be repeated as necessary.)

SKILLS TO BE PERFORMED:

- Exit: 1 second delay, more aggressive dive to delta, quick closing
- Boxman position
- Docking
- Catching
- Side sliding and orbit control

GOOD BREAK-OFF:

Demonstrate reasonable track.

PASS CRITERIA:

- 3-4 docks
- Demonstrating the correct techniques
- From 9500' minimum

FINAL EVALUATION

(Can be repeated as necessary.)

The final free-flown exit followed by a controlled approach to dock requires a minimum of a 2 second delay on exit. The novice should have a relatively smooth dive with a horizontal approach to the dock, and then dock within 3000' (about 20 seconds) of exit altitude.

Proximity maintenance entails the novice and coach facing off, then testing the novice's ability to follow a moving person (formation) in three dimensions (forward—backward, up—down, side—side) and then dock smoothly. Three moves should be tested in a dive from 9500 ft. (higher altitudes should demonstrate additional pins).

SKILLS TO BE PERFORMED:

- Exit: full 2 second delay, more aggressive delta, stopping above the target
- Boxman position: arms in proper position, neutral arch
- Docking: smooth, controlled, on level, positive pressure
- Catching
- Turning and side sliding

BREAK-OFF:

Flat Horizontal Track and distance for safe separation from a 4-way, open before 3000'.

PASS CRITERIA:

- From 9500' (minimum, more manoeuvres [points] expected if higher altitude)
- A 2 second delay
- Close within 3000' or 20 seconds from exit, showing a controlled approach
- 3 to 4 points (more if higher altitude), demonstrating the correct techniques of the jump, controlled approach and dock
- Solid Track, with adequate horizontal separation from a 4-way, minimal loss of vertical altitude (maintain close to horizontal level)

For example, the first move would have the Coach 2 move back 2m, down 1m, and turn 90°. For the second move, the Coach 2 would be positioned sideways 2m, up 1m, and turned away 90°. The third move could place the Coach 2 forward 2m and up 1m. All docks by the novice on the Coach 2 must be approached as face-to-face 2-way docks. The novice should exhibit control in all movements leading up to the dock.

Once you have passed the quiz and checkout jump, get them documented in your logbook that you are FS endorsed. A Coach 2 must sign the appropriate areas. Now that you have your FS endorsement, finish your requirements for the B-CoP. See an SSE (Skydiving School Examiner) for the B-CoP exam. After that, follow the FS progression as outlined in the freefall section of this manual as well as on the **Skills Grid**.

5.4.2 DOCKING PROCEDURE WITH PROXIMITY & LEVEL CONTROL

The objective of this exercise is to learn how to perform different angles (steepness) of approach with level and proximity control. It is the sum of the two skills. You should practise approaching from shallow angles as well as steep angles. The exercise will begin like the proximity practice exercise. Once your coach is set up, they can sink or float and you must respond correctly. You will have to perform correct downward and upward movements combined with forward and backward movements. Remember, it is your legs that make you move proximally. Use your hips to move down and upward. Keep the upper body in neutral position. This is best learned over a couple of jumps.

This exercise can be pre-planned as to what sequence you may want, or as a "Simon Says" exercise. As you demonstrate increasing control of level and proximity movements, the coach may start to add turns in to increase the challenge level.

In freefall, you approach the base (Coach) and dock (no grip). The coach then slides away to create a new base and signals you to approach again. As you approach, the coach will keep the fall rate constant; you must adjust your fall rate/level prior to docking successfully. Before docking, you should be stopped on level in front of the coach. Press the legs out to move forward into position.

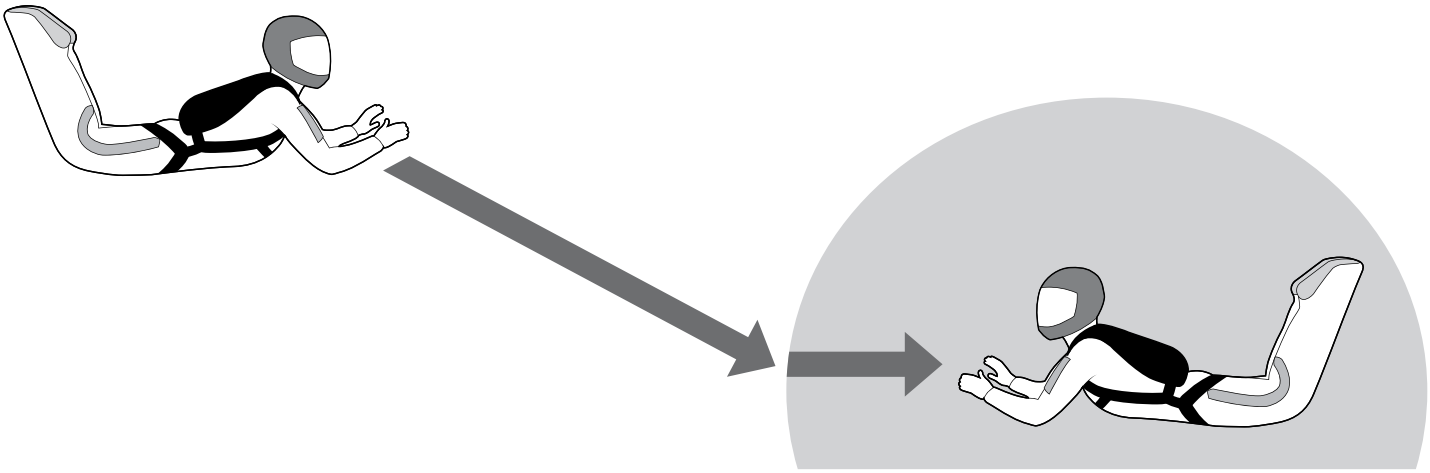

Figure 40: 2-way Approach Zone

To dock on a lower formation, you will also move downward at the same time as you move forward. Stop the forward and downward movement just prior to docking by flaring and performing a reverse arch for a short time.

Anticipate stopping on level by braking above your partner's level to stop on level. Get neutral immediately to prevent sliding back out. Now that you are level and just in front, get your legs out and finish the dock! Dock after you have stopped and are on level. Remember to initiate, coast and stop. The box position should be used when coasting.

To dock on a formation that is above you, you will also move forward at the same time as you move upward. The priority is to move **up first** (using your hips), then forward. Move yourself to a position that is 0.5 to 1 metre higher than the base and about 2 metres out. Stop the forward and upward movement by backsliding and arching for a short time. Get neutral immediately to prevent sliding back out. Now do a short down and forward to finish the dock! Remember, dock only when stopped and on level.

The area that extends from the grips of the person you are docking on, 10 feet out, and on level is called the **final approach zone**. These docking procedure exercises enable you to develop control in the final approach zone.

5.4.3 FS SIGNALS

Hand signals and visual motions are a valuable aid to successful FS. They should be reviewed during the dirt dive, and again in the aircraft prior to departure during the final verbal review before getting ready to exit. You, as the novice skydiver, should be able to describe the signals and their meanings, and know how to react when seeing them from the coach.

Since you cannot speak in freefall (other than mouthing commands), you will have three means of communicating:

- Verbal
- Tactile
- Signals with the hands

VERBAL

It is possible to understand the coach during the freefall as s/he shouts some simple words to you. They may tell you to "ARCH"; watch their mouth to see which word they are forming. The words used should be concise and discussed during the briefing.

An extremely effective technique consists of pronouncing the signals at the same time as done with the hand. The other jumper can read the lips and confirm comprehension of the signal. Pronounced slowly and with a smile, it will contribute enormously to making everyone relaxed. People can easily read the majority of the signals: relax, arch, head, legs, open, etc.

TACTILE

You should have received the basic instructions about the tactile (touch) signals before the jump. For example, if the coach is pulling on both of your forearms, this means to extend your arms forward more and relax; the coach shaking your wrists means to relax the whole body, breathe, etc.

Flying techniques have evolved enormously and the tactile signals are not limited, but these gestures are mainly used to adjust your body position. It is easy to raise the chin of someone who is looking down, to turn the hand in order to see the altitude better, etc. The key is that you are receptive and "relaxed".

HAND SIGNALS

Ensure that you know the signals that are used at your home dropzone, since these can slightly vary from one school to another. You must have sufficient time to study the signals. Explain each signal and write them down on paper to facilitate the learning. You must react instantaneously to signals during the practice time on the ground in order to maximise the freefall time. A hesitation or, even worse, confusion in the sky can unfortunately lead to a failed jump.

Below are some common hand signals, along with their interpretations.

Note: These might differ at your dropzone. It is important that all students and instructors at a dropzone adopt the same signals to avoid any possible confusion. Check with your home dropzone for specific signals used there.

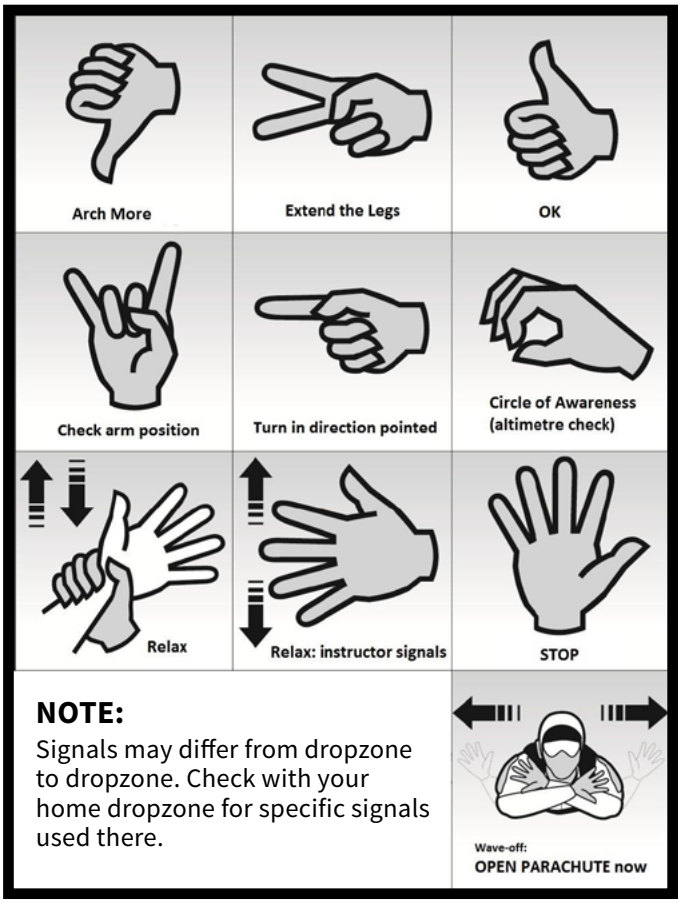

Figure 41: Freefall Signals

FREEFALL SIGNAL	REQUIRED ACTION
Crossing and waving the arms widely	**Break-off immediately!**
Wave off (by coach)	Break-off -OR- Caution, coach will pull now
Hands **gesture to come**	Approach
Outstretched arms forward with the **palms placed vertically** as if to push on an object	STOP!
Waving or fluttering (mimic) then **demonstrates a skill**	Mimic
Thumbs up	All okay, ready to proceed; or good one! -OR- Come UP to this level
Thumbs down	Come down to this level -OR- Arch more
Pointing	Look or move in the direction indicated
Tapping on head with any hand	Think; Relax
Pointing at any altimeter	Check altitude
Hand held up with the **index finger and pinky extended** and it may be waved	Check your arms
Index finger of both hands **pointing at each other**	Knees closer together; tap your feet
Index finger of both hands **pointing away from each other**—It may include the direction of motion also	Knees wider
Raising elbows up in a pumping fashion	Elbows up
Motion with arms to **pull them back** or **push them forward** in a pumping fashion	Elbows back/forward
Coach Breaks Off on a 1:1 basic FS coach jump and tracks away	**Deploy immediately!** Do not track as you risk being low. This means that next jump you need to work on altitude awareness. Be altitude aware next time!
Coach Deploys on a 1:1 basic FS coach jump	**Deploy immediately!** This is a definite indication that you are low.

Figure 42: Additional Freefall Signals

5.4.4 FREEFALL GRIPS

There are many ways of taking grips in freefall. It starts with docking, or stopping in your assigned slot or place in freefall. Proper grips of arms and legs can be taken both high and low on the appendages. Take the grips the same way as was planned or instructed in the dirt dive. Grips should be taken in a manner that does not disturb the formation nor interfere with the other flyers. After you have taken grips, pay attention, and keep flying. Push or drive toward the centre of the formation and eliminate any tension. When beginning FS, it is good to take grips by flying yourself to a position and stopping where you can put your hand on top of your coach's grips without actually taking them. This may seem hard at first but it will help refine your neutral position quickly because you have to keep flying at all times!

To fly in the formation there are several tips that will help. For in-facing docks, fly with your legs slightly extended and upper body arched. This establishes a slight positive pressure to the centre of the formation. Fly towards any tension to try to eliminate it. Pick up your grips and make sure you are still in the box with elbows and hands up ("pick up" your grips). These suggestions, plus paying attention, help in maintaining the fall rate of the formation.

We use several terms concerning grips. "Presenting" means that you put your arm or leg in a certain place so that someone can grip it. The person who is going to take that grip is "taking" or "catching". "Stiff-arming" is a technique to absorb a hard dock. It starts with a straight arm and moves back to the box as the presented grip hits the taking hand. During that short time, try to absorb the momentum of the dock. Skydiving will consist of presenting and taking with minimal stiff-arming!

A suggested standard for advancement is the ability to close vertical and horizontal separation in a single exit and to finish with a safe dock, and then perform three additional manoeuvres to dock in one dive (for example, down dock 2 times, plus 1 up dock) from 9500 ft. You must be able to demonstrate the docking procedure with quadrant control as a requirement for the FS endorsement. See **FS Endorsement** (§5.4) at this time.

5.5 BREAK-OFF PROCEDURE

The Break-Off And Track procedure (or BOAT) is used to create separation from other skydivers at the end of a FS jump in order to get unoccupied air for safe deployment. Developing a good attitude towards altitude awareness and potential traffic problems is paramount. When learning the break-off procedures, start at 1000-1500 feet above your planned opening altitude. As your skills improve, your planned opening altitude may lower, but the 1000-foot rule for break-off will always apply in small formations.

IMPORTANT: YOU MUST BE ABLE TO DEMONSTRATE, CONSISTENTLY, THE CORRECT BREAK-OFF PROCEDURE, WITH ADEQUATE SEPARATION, AS A REQUIREMENT OF THE FS ENDORSEMENT AND THE B-COP REQUIREMENTS.

The correct break-off sequence should be demonstrated on every FS jump::

- Shake or wave-off at the assigned altitude (one wave/shake only)
- Start to cup air (de-arch the hips) to produce LIFT during the turn
- Turn 180° from the centre, continue to cup, and stop the turn; it is important to know your flight path of 180° from the centre so that you do not cross someone else's flight path
- Still cupping air, start tracking with your LEGS only, leaving your arms forward, to avoid "tipping" at the start of the track
  - Slowly bring the arms back
  - Keep looking all around: left, right, forward, up-right, up-left, forward-down
  - Pick a line to maximize separation
- Track away as far as possible for 3-5 seconds, looking forward (heading) and to the sides (traffic)
  - Flat Track: if most people are higher, then you are diving too much; push the arms down and suck up the stomach/hips to gain more lift
- Set your audible 500 ft higher than your deployment altitude so you know when to stop tracking; even with an audible altimeter, you should count in your head how long you have tracked, in case you miss hearing the audible, or it stops working
- In one simultaneous motion, flare (stop), look straight up over your head, and wave as a pull warning to others
- Pull by the prescribed altitude. Regardless of how long you move forward, you should always pull at the correct opening altitude for your level of experience.
- Keep your eyes peeled around you for other canopies opening; immediately grab your rear risers, ready to take avoiding action if needed
- Keep your canopy flying away from the formation centre for at least 10 seconds to continue the separation

You have two responsibilities at break-off:

1. Make sure you are clear from being over top of someone (look forward and below); and

2. Ensure that it is clear over top of you. Since you cannot easily see over top of yourself, it is important to wave to signal your intention to pull in case anyone is above/behind you.

If all FS skydivers do this at break-off, then theoretically there should be no freefall or canopy collisions. The entire break-off procedure should be completed in 7 seconds.

TRACKING & THE ENDORSEMENTS

2-way Endorsement for A-CoP—"Demonstrate adequate forward movement separation sufficient for a 2-way". Once you have the A-CoP, you will be permitted to jump with one other person while working on your B-CoP. You do not need to "track" for the A-CoP, although your coach might start teaching you to track as your skills allow.

Group FS Endorsement for B-CoP—Demonstrate a flat track "adequate with for separation from a 4-way", with horizontal movement (minimal-to-no vertical altitude loss) during the horizontal track. The key here is:

1. Adequate horizontal distance, separation from a group, and
2. Horizontal movement, with minimal-to-no vertical altitude loss.

As your track improves, you will increase the forward speed while at the same time improving altitude gain. Keep practicing!

▶ SAVE YOUR LIFE!

Break-off procedures are THE most important component of the freefall portion of your skydive. It is the part of your skydive where you remove yourself from the formation and assure you have the airspace to deploy your parachute safely, away from everyone else. Waving off at the correct/decided upon altitude, tracking away, scanning your airspace, waving off again to signal deployment, deploying your canopy at an altitude that is safe for you, and being ready for an emergency canopy avoidance manoeuvre (rear riser 90° turn) are all important components of a safe break-off procedure. You must be able to demonstrate consistently the correct break-off procedure with adequate separation as a requirement of the FS endorsement and the CoP requirements.

Break-off is a life-saving necessity. With the increasing number of jumpers in larger formations (4- way, 8-way, 10-way, 200-way, etc.) the need for horizontal separation prior to canopy deployment is paramount. The larger the formation, the greater the potential for freefall or canopy collisions upon opening. If the formation is large enough, a staged break-off is used, making it quite important to follow decided upon altitudes for both break-off and opening. With smaller canopies and the resultant higher wing loadings, separation that is even more horizontal is required due to the higher canopy speeds after opening. Due to the characteristics of smaller parachutes, break-off altitude from the group may need to be higher to allow for a higher opening altitude for individual canopies.

Taking all of this into consideration, we MUST learn to track far, straight and horizontal (flat or better, track "up"). If you cannot track properly, you put yourself and those around in grave danger. Having a correct break-off procedure not only enhances your safety, but the safety of the other jumpers in the formation. Break-off altitudes should be discussed as part of the dirt dives, as larger formations not only need to have higher break-off altitudes, but also might include breaking off in waves.

HOW WELL CAN YOU TRACK?

Ask yourself the following questions:

- Do you truly know how well you can track?
- Do you know how far you travel?
- Do you know how horizontal your track truly is?
- Are you using the correct, modern body position, or some older method that is less efficient?
- Are you very good at flying on your belly?!

Freefliers also need to know how to fly on their belly and track fast, flat, and in control!

MISCONCEPTION: *You cannot "scan" for canopies below if you are tracking away on your back or performing a barrel roll! Barrel rolls are not recommended.*

To reiterate, developing a solid, competent, break-off procedure that is safe not only for you, but for the other skydivers you are sharing the air with, is very important and should be taken seriously. Please seek out a Coach 2 to teach you proper break-off and tracking skills, and work to develop these important skills early on in your skydiving career. There will be a time when you are grateful you took the time and jumps to master these lifesaving skills.

RESOURCES:

USPA SAFETY ACCIDENT REPORTS—CANOPY COLLISIONS, AVAILABLE AT:
USPA.ORG/TABID/81/DEFAULT.ASPX?CAT=CC

VIDEO—BAD TRACK + LATE DEPLOYMENT + INATTENTION, AVAILABLE AT:
YOUTUBE.COM/WATCH?V=MRXOOHKOPVC

SKYDIVERS NEARLY COLLIDE, AVAILABLE AT:
DROPZONE.COM/CGI-BIN/FORUM/GFORUM.CGI?POST=4470397

▶ 5.5.1 THE TRACK

The track is used to create forward motion, losing minimal altitude, to create distance between jumpers at break-off. The track uses a flat or reversed arched body position (a combination of the two skills of forward movement and reverse arch [cup] which you have learned previously).

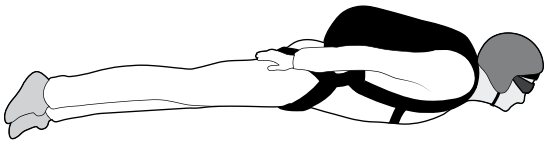

Figure 43: Tracking

A fully streamlined track position will create the fastest forward speed. The track has a range of speeds from slight to approximately 70 mph horizontal speeds, with a minimal altitude loss, depending on individual proficiency. The major use is for achieving separation from other jumpers at break-off. The priority is direction first (heading control), and then speed. High speeds experienced in these positions demand caution in their use.

The steps to initiate a track are:

1. Starting from a relaxed box, de-arch (cup) at the hips, flatten the body and start to go "up", looking forward to the horizon.
2. Turn 180° from the centre, scanning left and right—know who is beside you.
3. Extend the legs fully and narrow them slightly or pressed together; knees should be "locked".
4. After forward movement has begun, sweep the arms to your sides, rolling the shoulders inward and sucking in the stomach. Hands should be forward of the hips (downward) and pressing hard on the air. Think of hugging a giant beach ball. Arms are the LAST body part to be placed in position.

The track will become more effective (faster) the more the body is streamlined. This is done by smoothly bringing the legs together to about parallel with the shoulders, and bringing the arms right into the side and slightly forward. Final trimming of the track can be done by slightly lowering the head. Eye contact with the horizon should be maintained. Start with directional control before speed. Hold the desired track position to continue movement. Heading can be maintained by extending or retracting a leg (using rudder control) or by moving your arms.

To counter the track: Smoothly sweep the arms back to a spread arch, and flare to stop.

As you get more comfortable with the track, you will need to learn to LOOK for traffic all around: right, left, forward, up and down.

FLARE

A flare is the same as a backslide position, but has a reverse arch (cup) instead of an arch. This position is used when countering a track, dive, or delta to eliminate forward and/or downward speed by changing the body position to create a braking action.

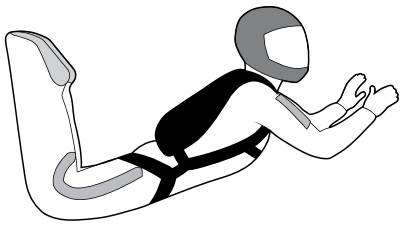

Figure 44: Backslide or Flare

The steps to flare are:

1. To stop the movement, pass through the box position.
2. Immediately adopt a maximum reverse arch position and/or simultaneously adopt the backslide position.
3. Hold position until the movement being countered (flared) has stopped.
4. Return to the neutral box position.

IMPORTANT: TERMINOLOGY DIFFERENCE—YOU WILL OCCASIONALLY HEAR PEOPLE DISCUSS, INCORRECTLY, DELTA AND TRACK AS THOUGH THEY ARE RELATED SKILLS. IN FACT, THEY ARE OPPOSITE SKILLS, AND THE DISTINCTION SHOULD BE VERY CLEAR.

DELTA TO **GO**	TRACK TO **STOP**
Performed at exit	Performed at break-off
Used to approach formation	Used to get away from a formation
Covers vertical distance, can lose altitude quickly	Does NOT lose altitude (gains altitude if performed correctly)
Can cover some horizontal distance	Covers maximum horizontal distance

Figure 45: Delta vs. Track—NOT the Same Thing

TIP: "DELTA" VS. "TRACK"

THERE IS NO SUCH THING AS A "DELTA TRACK". YOU SHOULD REMOVE THIS TERM FROM YOUR VOCABULARY.

5.6 FREEFALL TECHNICAL KNOWLEDGE

5.6.1 THE BOX → MANTIS

The box body position was discussed briefly in PIM 2A. We would like to elaborate on the purpose of the box, as a key to sequential FS. As mentioned in the previous manual, the box is a widespread, symmetrical falling position. When falling in a neutral position, the body should be slightly arched to spill air and remain in one spot. The box position should be as widespread as comfortable. This is achieved by spreading the legs as wide as comfortable in the arch position, and by placing the arms sideways from the shoulders (90°) with a bend at the elbows (90°), positioning the hands just slightly in front of the head. The position should form a square when drawing lines from elbow to knee.

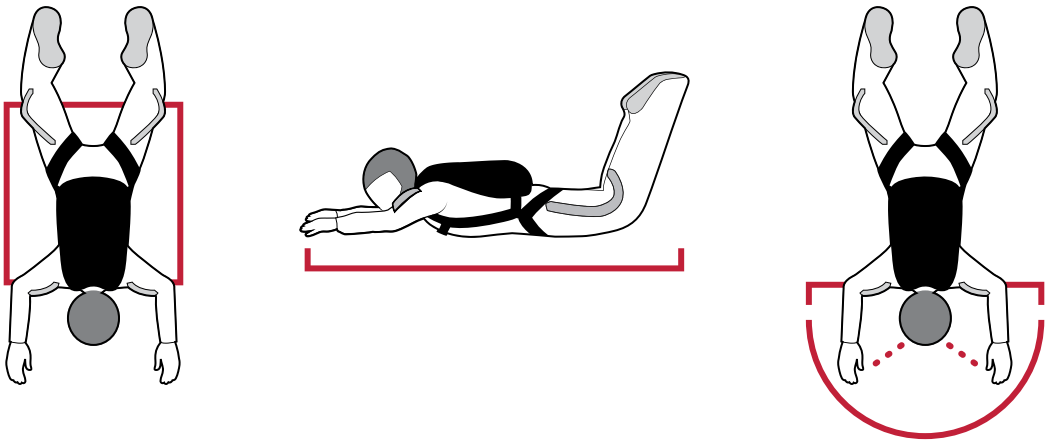

Figure 46: Box Position Showing Equal Balance

The advantages of the box position for Formation Skydiving are:

- The square position allows the completion of certain sequences with just a centre turn on the spot.
- The wide stance provides more lateral (side-to-side) stability while falling. It also provides a solid failing position that can take a rough dock and not knock the skydiver or formation into an unstable position.
- The positioning of the hands being equal to, or forward of, the head is a good placement to receive docks or take grips without changing the body position.
- This body position gives formations geometric and structural integrity, which permits them to build and fly properly.
- The box stance allows for efficient movements with only minor joint movements due to the effect of full body air deflection (e.g. twist your waist).

THE MANTIS POSITION

The mantis is an adaptation of the box into a more streamline, narrower body position. This produces a faster fall rate, faster centre turns, and a more heads-up view across the formation. There is a trade-off of stability for faster manoeuvrability.

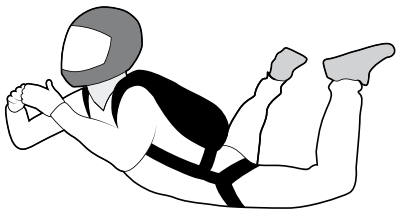

Figure 47: Mantis Position

Instead of holding the arms square at 90°, the elbows are tucked down, and the forearm is presented at a 45° angle, with the hand just in front of the neck about 15cm apart. A slight cup of the hands will help with a natural head-up orientation. Keep a slight arch at the hips in order to maintain manoeuvrability up or down. Legs are slightly extended to compensate for the change in arm position. In addition, legs are typically closer than they are in the box position. In fact, the legs become much more important to control your flying in the mantis position.

As a student, you started out in the "hard arch" or "spread eagle" position: a wide stance, hips pushed forward. It was very stable, but it was difficult to move. The transition to the relaxed box position traded a little loss of stability for a gain in manoeuvrability. The same holds true when going from the box position to the mantis: slightly less stable, but much more manoeuvrable. If we were to continue this transformation, you would end up in the style tuck position, which is extremely unstable, extremely fast, and therefore highly manoeuvrable.

Work with an experienced FS Coach 2, who can help you make a smooth transition from the box position to mantis. It is a new position to learn, so give it time and lots of practice and soon it will become autonomous.

RESOURCES:
NATIONAL SKYDIVING LEAGUE—MANTIS EXPLAINED, AVAILABLE AT:
WW1.SKYLEAGUE.COM/PAGES/NEWS/SHOWARTICLES.PHP?STORY=1055&NSLYEAR=2008

5.6.2 SAFETY FOR SMALL GROUP FS

While safety is an obvious concern for skydivers regardless of the type of activities they pursue, there are specific concerns related to the activity of FS that are additional to those covered during the Basic Skydiving Skills programme. When skydiving with others, the actions of one skydiver can affect the safety of the whole group. This is why it is important that each skydiver learn and practise the skills discussed here. The next five paragraphs approach safety from a proactive and preventative point of view.

PREPARATION

- When preparing to make a load, be conscious of the weather conditions and the wind limit of the lightest person/slowest canopy on the load. This includes reserves.
- Do not jump in high winds, fading light conditions, and/or poor visibility, even if one or two of the group members are "good enough" to make the load.
- If there is some reason for delaying or cancelling the jump then do so. Racing the weather can get everyone in danger.
- Be sure everyone is oriented to the DZ.
- Select a skydive with realistic tasks and conduct a proper dirt dive including exit practice.
- Ensure that everyone involved has the proper endorsement for the activity.
- Get a safety check prior to boarding the aircraft.
- Having a safety-oriented attitude is common sense.

IN-FLIGHT

- Make sure that the pilot is briefed and that everyone knows the normal and emergency procedures for the aircraft.
- Conduct mental rehearsal and relaxation during the ride up.
- Know what is to take place during your skydive.
- Do an in-flight handles check and visually scan others for missed items prior to the door opening.
- During the climb out and exit launch, be conscious not to snag your own equipment, nor the equipment of any of the other persons on the load.
- Assist each other during the climb out to ensure that equipment is clear from any snags before moving.
- When set-up for the launch, check your position to ensure that the launch will be clear.
- Avoid snagging jumpsuits, gloves, etc. on the step or in the door frame.
- In the event of an accidental activation while on the outside of the aircraft, get off immediately if it is your equipment. If it is someone else's gear, ensure that they leave immediately. Push/pull them off if you have to. You are potentially saving their life as well as your own and anyone else who is on the plane as well as the aircraft itself.
- Immediately after launch, do a quick observation circle to ensure that everything is progressing smoothly.
- If you must exit lower than the planned altitude, remind everyone that this is a shorter skydive. Be altitude aware.

FREEFALL

- Know the jump and stick to the plan of the dirt dive.
- Follow the rules of conduct for the jump discipline (e.g. 4-way, 8-way).
- Fly “heads up”, staying aware of the big picture.
- Have an altitude-sensing device (audio and/or visual) and monitor your height on a regular basis.
- Fly at slow speeds when close together.
- Stop movement just before making contact rather than using another person as a backstop.

- Final approach should be level and slow.
- When diving, dive to an area or quadrant.
- Use a dive technique that enables direct sight with the formation. Do not dive blind.
- Remain in your quadrant for the rest of the dive.
- Take grips in formations carefully.
- Avoid snagging parts of someone else's gear (i.e. risers, harness, etc.).
- Grips should not be taken deep in the harness or leg straps.
- Let go of grips if someone is shaking or kicking as they may have a problem that you are unaware of.
- In freefall, the lower person has the right of way.
- If someone has an equipment problem in freefall, like risers and lines trailing behind them, point out the problem to them any way you can. Avoid contact with them if possible.
- If you get low on the formation and begin to slide under, turn immediately, and go back out from the formation into your quadrant. Come up above the formation and try the approach again. If someone falls on you, protect your head, regain control, and check altitude. Decide what is next.
- If you are high on the formation and begin to slide over top, turn immediately, and go back out from the formation into your quadrant. Come down to a flatter angle to the formation and try the approach again.
- If you fall on someone, stay arched or flat-bodied and drop your hands below you, with bent elbows, to protect your front from the person you may hit. Keep your body extended; do not tuck into a ball as this exposes your boney surfaces (knees, elbows) which can potentially contact someone's head or equipment. It is better to fall flat onto someone. If you are on top, push the person out from underneath of you with your palms. Once you regain control, check the altitude. If there is still time, continue with the dive plan.
- If there is a funnel or loss of control, get stable and check your altitude. If there is time, everyone should work to the base or low person, setting up in a face-to-face (e.g. star) prior to continuing with the next point.
- If jumpers are on a collision course, they need to take action to avoid each other. To avoid a mid-air collision in freefall or under canopy, both skydivers should turn right. If the collision direction is the same way from someone overtaking, the overtaking jumper passes on the right of the slower jumper (e.g. right-of-way).
- If someone is flying under you, especially at pull time, it is your responsibility to move away from being over top of the lower person.

- Break-off should be at the pre-determine altitude discussed during the dirt dive and final rehearsal (e.g. 4500').
- Turn so you are 180° from the centre of the formation and flat track after break-off; flare, check surrounding air, wave and activate before your planned opening altitude:
    - Persons breaking off using a steep delta create a problem. This creates multi-levels of jumpers at pull time. If someone is below you at break-off, change direction and get clear from being over top of a lower person. If someone is over your back during break-off, you have the right of way and should stay on your same path and try to outrun the person above. Deploy clear of others without being low;
    - If failure to break-off at 3500'/1000m AGL has placed the parachutists low, the emergency break-off procedure should be to break and turn 180 degrees from the centre, track until pull altitude, activate the main, grasp rear risers immediately, and prepare to initiate canopy avoidance techniques;
    - If failure to break-off by the pull altitude, turn 180 degrees from the centre and activate main immediately, grasp rear risers immediately, and prepare to initiate canopy avoidance techniques;
    - If failure to break-off is below opening altitude, activate your main immediately, grasp rear risers immediately, and prepare to initiate canopy avoidance techniques;
    - If failure to break-off is below 1500', go directly to the reserve to avoid a two canopy out situation due to the possibility of an AAD firing. Grasp the rear risers immediately, and prepare to avoid other canopies.
- Anyone who is in the process of opening has the right of way.
- A wave-off is a signal that the skydiver is about to pull.
- Be aware if there is a video skydiver on the load as the centre belongs to them at break-off. Larger formations or formations with multiple videographers require special attention and briefing discussion.

CANOPY

- First, get your hands on the rear risers and check for, and avoid, others in the air.
- After performing your canopy check, locate all of the others in the air around you.
- Failure to attain adequate separation before pulling or lack of visual observation during descent can result in a canopy collision. For a collision on opening, immediately attempt to clear any entanglements which restrict movement, attempt to verbally inform (shout!) the other parachutists of your intentions, activate the

reserve if necessary. Consider a cutaway only if altitude permits. In this case, the top parachutist controls the situation; the bottom parachutist must listen and communicate with the top. All commands given are positively as "do this" commands only. Speak with a Coach 2 for further information.

- Radical canopy flight (i.e. riser spirals) is to be avoided in congested areas, at low altitudes, and especially when flying above and into the landing area.
- Check over your shoulder, behind and below you prior to executing any type of turn.
- Landing approaches should emphasise a safe landing for each person, preferably staged.
- Fly clear of the wake above and behind a descending canopy; always offset to the right side if following behind another canopy.
- If during your approach pattern, the landing area is congested with others landing, then go land in another clear area. Canopy collision on landing requires that you place your feet and knees together and try to flare as normally as possible. The ideal is to not get into this situation in the first place by flying a canopy approach and avoid flying in the wake of another canopy. Use ½ brakes to slow yourself down to give more separation from a canopy in front of you; but do fly full flight the last 10 seconds for the flare.
- Do not S-turn on final approach, as this will cut off other canopies. Pick a lane and go straight all the way.
- After landing, deflate your canopy immediately to avoid having someone else go through it while they are landing.
- If you have a malfunction, carry out reserve procedures as required. In the case of a cutaway, remember to check below to make sure you will not drop on another canopy.
- If someone else has had a malfunction, other skydivers should follow or observe the landing of the main and free-bag, as well as the safe landing of the parachutist. Do not try to snag either of these while flying your canopy. Someone should follow the person under reserve all the way to the ground, especially if they are under a round parachute.
- Watch out and show respect for spectators.
- Follow the canopy rules of the air as detailed in the Ram Air Information section of PIM2A.

EQUIPMENT

- Keep your gear well maintained.
- Check closing loops, Velcro, and ensure the reserve is in date and sealed.

- Make sure the gear is compatible for the desired activity and properly matched to your weight, experience, and DZ elevation.
- All handles should be securely in place. All AAD's should be properly maintained and calibrated.
- Only jump familiar gear when doing FS; avoid jumping borrowed gear while doing FS.

5.6.3 MODEL FOR THREE TURN TYPES

In the past, jumpers have been taught to initiate turns using their head and arms. In sequential Formation Skydiving however, these limbs are otherwise occupied and another method of turning is preferable. The three turns are the center, chest and knee turns. The turns are named for the **pivot points at which the body will rotate around**, i.e. centre turns pivot about the centre of the body, vertically straight through the torso.

CENTRE TURN

By simply twisting the torso to misalign the shoulders from the hips, the jumper assumes the shape of a propeller. When the right shoulder is higher than the left shoulder the jumper spills air to the right that pushes the upper body to the left (action and reaction). With the hips tilted (right hip lower than the left hip) and the lower legs laying down to the left side, the lower body is pushed to the right. This results in a turn around the center of the body.

During sequential Formation Skydiving, it is not always efficient to turn about the center of the body. Certain transitions may require the jumper to pivot about the chest or a knee. To accomplish this, the jumper should visualise their body as being made of two independently controllable parts.

CHEST TURN

(A turn with the knees.) To pivot about the chest as the axis, the jumper tilts the lower body in the direction of the turn and can lay the lower legs to the left or right depending on the direction. The upper body maintains the arch position.

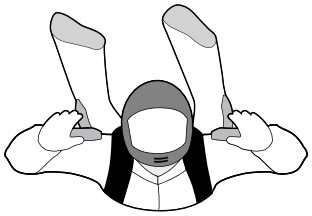

Figure 48: Chest Turn using Lower Legs

Here is an exercise where the objective is to have you learn to perform turns using only the lower body only to initiate the rotation. By dropping a knee, offsetting the hips or laying the lower legs to one side, a rotation around the chest will occur. The chest will be the pivot point for the turn and therefore, this is referred to as a chest turn. The key points for this exercise are identical to those for the center turn.

- Open accordion, 90° turn, side body, repeat.
- 2-way closed star, 90° turn, 2-way open star, repeat.
- 2-way closed star, 180° turn, cat, repeat.
- Stairstep, 180°, compressed accordion, repeat.

Do these exercises from both sides and alternate with your partner. This will develop your turn skills in both directions.

KNEE TURN

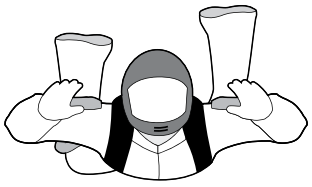

Figure 49: Knee Turn

(A turn with the chest.) To turn about the knee as the axis, the jumper tilts the upper body in the direction of the turn and maintains position with the lower body.

Here is an exercise where the objective is to learn how to perform turns using the upper body only to initiate the rotation. By dropping an elbow or shoulder, a rotation will occur. The knees will be the pivot point for the turn and therefore, this is referred to as a knee turn. The key points for this exercise are identical to the center and chest turns.

- Side body, 90° turn stairstep, side body, repeat.
- ½ bipole, 90° compressed, repeat.

Do these exercises from both sides and alternate with your partner. This will develop your turn skills in both directions.

When designing jumps, each jump should focus on one type of rotation. That way you will have an opportunity to repeat the action several times so you can evaluate each turn and the relative success with each.

▶ 5.6.4 MODEL FOR GROUP FREEFALL

This model looks at the three conditions that a group in freefall must satisfy in order to do Formation Skydiving. The three conditions are:

- Level
- Proximity
- Timing

Level—is concerned with the group of skydivers all being at the same level, exactly the same height above the ground.

Proximity—is their distance from each other. Two skydivers could be level, but their distance apart might be 15-30 metres; they are not in good proximity to each other. Two skydivers who are close enough to touch are in great proximity to each other.

Timing—is concerned with activities that coincide. Two skydivers could be in the air at the same time and pass through the same physical point in the sky, but if they pass through that point at different instants, they will not connect with each other. To link, they must be in the same point in the air at precisely the same time. Two or four skydivers who form a hook-up or star, then make 360° turns and attempt to re-dock, will be more successful if they simultaneously complete their turns.

In order to do Formation Skydiving, a group must satisfy all three of these conditions. They must be level, close together, and complete their actions at the same time. Looking at how this information can be used by skydivers when they do Formation Skydiving, they should:

- Have the same rate of fall and altitude (level).
- Work closely together, moving to the centre (proximity).
- Dock simultaneously, executing their actions together (timing).

These physical parameters, if satisfied, will allow skydivers to achieve excellent results in freefall Formation Skydiving.

▶ 5.6.5 FS RULES & COURTESIES

FS RULES

1. Exit fast,
2. Fly slowly,
3. Enter cleanly,
4. Take your proper grip,
5. Fly with the formation, and
6. Turn and track at break-off.

Exit fast—allows everyone to be closer together (tight) in freefall, and the time taken to the first formation will be decreased for exits without grips. Whether a free-flown (no grips) 4-way or a line up on a big way, being tight and exiting fast will help the dive.

Fly slowly—means to remain in control, within your limits, allowing you to do your job correctly the first time, every time. Remember:

SLOW → **SMOOTH** → **FAST**

FIRST YOU GET **GOOD**. THEN YOU GET **FAST**. THEN YOU GET **GOOD AND FAST**!

Enter cleanly—means always docking in a manner that does not disturb the formation. Small-way or big-way, in-facing, sideways, or out-facing, it is always the same way. Carrying momentum in any direction into the formation risks waves or even a funnel. Remember the correct docking procedure. Dock on level and in control.

Take your proper grip—means exactly that. The grips and slot that you have been assigned are important for the success of the dive. Grips are taken a certain way so as not to impede a fellow skydiver's flying ability or your own. Take your assigned slot; it is yours and no one else's. Do your job.

Fly with the formation—means to keep flying your body after you are in the formation. Remain alert and conscious of your job and others around you. Pay attention and cross reference through the formation's center point. Everyone is counting on you to do so.

Turn and track at break-off—is essential for the safe opening of parachutes. Everyone has two responsibilities at the assigned break-off altitude. One is to make sure that you are not over top of anyone. The second is to make sure it is clear above you before you deploy. Carry out the correct procedure regardless, as other people having problems and/or camerapersons may need the space. If everyone follows this, then freefall/canopy collisions should not occur. Tracking is essential for safe break-offs. Avoid delta dive, steep-angled dives, and stand-ups: these are not recommended and are dangerous for everyone at break-off.

REMEMBER: *FS is a group effort, and the formation is the first priority.*

FS COURTESIES

- Be considerate of others—their time and their feelings.
- Be ready with the group.

• Cooperate with the load organisers, manifest and the pilots; without them you will not get many jumps.

• If you go low, move far out from your quadrant, come above the formation, and approach again properly. Do not loiter beneath the formation or beneath an approach area.

• Go to your quadrant high, approach facing your slot, and remain in your quadrant at all times. Do not circle the formation; you will cut off other skydivers.

• Always proceed as planned, take your assigned slot, do your job and only your job. Always follow the plan; there is no "Plan B".

• Pull at the required/assigned altitude.

• When you land, come back for a debriefing; admit your own mistakes, but never point out someone else's mistake.

• Use your energy to prepare for another jump; make a good jump rather than re-living a bad one.

• Focus on the positive and the points that need to be improved upon, as you will achieve more in the end. Being negative is destructive, as opposed to constructive improvement points.

• Remember, others have to learn sometime, just as you did once.

▶ 5.6.6 MAINTAINING THE FALL RATE

The rate of fall adjustments should only occur through the hips and torso, by either spilling or cupping the body, with little or no change from the box symmetry. When performing sequential Formation Skydiving, we find that our rate of fall must be changed constantly. Every time we turn or slide in any direction, we spill air that causes us to fall faster. When we move we must either compensate for the spillage of air or hope that the base does this for us.

The latter only happens on well-trained teams who pre-plan such a compensation whenever their teammates have a long move to make. Because we will spill air every time we want to move, we ideally want our base to always start with and work towards maintaining a good rate of fall. Once this fall rate has been established, we then work at maintaining a constant rate of fall through the entire jump. This constant rate of fall provides the flakers (skydivers docking on the base) with a target whose location they can anticipate. This entire rate of fall setting and compensating is done with a minimum amount of variation from the symmetry of the box position. This body position disciplining is one of the basics of becoming a good sequential Formation Skydiver.

▶ 5.6.7 THEORETICAL INFORMATION QUIZ FOR FS ENDORSEMENT

Do you know the answers to the questions for your FS endorsement?

PREPARATION:

1. **BSR's** are intended to avoid or reduce fatalities. Is participating in FS without being FS Endorsed breaking a BSR? Which BSR is affected? Can it lead to a fatality or other problems?
    - Look at the USPA Accident reports: **uspa.org/USPAMembers/Safety/AccidentReports/tabid/81/Default.aspx** How many are due to collisions [Filter by Category]? How many were fatal?

2. Is a B-CoP holder allowed to do FS skydives with A-CoP holders? Are there any restrictions?

3. Discuss why "big" formations may not be "better".

IN-FLIGHT:

4. Describe several procedures that you should complete prior to a FS jump and during the aircraft ride that will enhance your performance.

5. Name four common exit positions from a C182? From a side-door turbine?

6. Describe the **exit order** for groups and individuals from a larger aircraft. Why is it ordered so?

7. What is the minimum **separation** (in seconds) after an individual and/or small group exits? How does this separation change for larger groups? What is included when counting separation time?

8. On the way to altitude on a 4-way jump, one of your partners discovers an equipment problem, and s/he chooses not to jump and will ride the plane back down. Describe three safe courses of action that the rest of your group could take.

FREEFALL:

9. What is meant by the term "funnel"? What actions do you take when a formation begins to funnel?

10. To close a long vertical distance on a FS jump, where should you direct your dive to in order to minimise the possibility of a mid-air collision?

11. Define Start–Coast–Stop, and the final approach zone.

12. While on a 5-way FS jump, you find yourself low on the formation. You begin to slide underneath it. Describe your immediate actions.

13. While participating in a 4-way FS jump, you notice that the group is significantly below break- off altitude. Describe your immediate actions.

14. Describe the correct break-off sequence, and the altitude(s) at which it is recommended to occur.

15. As you are tracking away at break-off, you notice another jumper tracking right below you. What are some options that you should immediately take to avoid an incident?

16. You see a canopy opening up in front of you as you are tracking. What are your immediate actions?

17. During a 4-way, you find your group heading toward a cloud. What do you do in each of the following situations:
    - The group is falling into a cloud at 8000', departing the cloud at 6000'?
    - The group falls into a cloud at, or just before, break-off?
    - The group is within the cloud during canopy opening?

18. You are in freefall, and have fallen below: (a) break-off altitude, or (b) opening altitude. What are your immediate actions?

19. Describe the tracking sequence. Where should you be looking before initiating the track, and during the track?

CANOPY CONTROL:

20. Immediately after your canopy is deployed on a FS jump, you notice that another canopy is about to collide with yours (horizontally). What is your immediate action?

21. After a FS jump, is it ok for you to perform unplanned CFS with your friends?

22. While beginning your accuracy approach you notice that the approach and target area is congested with other canopies in the air. What should you do to ensure a safe landing?

5.7 VIDEOGRAPHY IN FREEFALL

Camera flying (still and/or video) can be a very rewarding experience. It gives you a chance to document the performances of others, and provide lasting memories for all levels of jumpers. Camera or videography, which used to be limited to higher licence and experience levels (B-CoP), has become commonplace on dropzones today. The higher experience level is recommended to both increase the chances of success and to reduce the risks involved. So too has the number of accidents and incidents involving camera flyers, both directly (the equipment itself) and indirectly (not paying attention to the skydive and losing track of altitude or movements).

PIM 1—§3.22 CAMERA JUMPS: "EXPERIENCED SKYDIVERS MUST POSSESS A MINIMUM OF A B COP AND 200 JUMPS. THEY SHOULD BE COMPETENT IN THE FREEFALL DISCIPLINE IN WHICH THEY WISH TO PARTICIPATE AS A VIDEOGRAPHER, SHOULD SEEK ADVICE FROM EXPERIENCED FREEFALL VIDEOGRAPHERS REGARDING THE TYPE OF EQUIPMENT TO BE USED IN ORDER THAT THEY MAY SAFELY ENGAGE IN THIS ACTIVITY. AT LEAST ONE FUNCTIONING AUDIBLE ALTIMETER MUST BE USED, AND AN AUTOMATIC ACTIVATION DEVICE SHOULD ALSO BE USED."

One should be a very proficient, skilled skydiver before flying a camera. Things can go wrong very quickly and require immediate action, and distraction to divert your attention further increases the risk to all. If you cannot control your freefall, or land accurately without a camera, you will have difficultly when you start flying with a camera.

Finding a coach for camera flying can be very difficult. However, take the time to find someone who is willing to discuss with you and aide you in your development of camera flying. Trying to learn it all on your own will not only be dangerous for yourself and others in the air near you, but a very expensive learning curve. It is imperative to get experienced assistance in order to progress safely and more quickly. Paying attention to the skydive is of primary concern; flying with a camera is secondary.

- How to choose equipment (video and still cameras, mounts, switches)
- Camera helmet construction: manufactured or altered
- Camera attachments: wide-angle lenses, flashlights
- Turning camera on/off, mouth-switches
- Training on jumpsuits with wings
- Flying your canopies while wearing additional equipment (restricted movements)
- Aircraft exit strategies, door types, and care inside the aircraft
- Break-off procedures
- Emergency procedures when wearing camera equipment and camera suit

Different situations require different flying skills for the camera flyer. Flying to record one person on their belly is significantly different from recording the same person performing a series manoeuvre; how far away to be, at what level, how to maintain a consistent distance, anticipation of fall rate changes, etc. Consider flying for 4-ways, flying for bigways, how to exit the aircraft for different types of groups (rear float, dive), and when it is important to keep on heading (videoing a series) and when it is not (artistic freeflying). Flying video is multi-faceted, and as such, one needs the skills and experience to handle the dynamics of these different situations in order to avoid collision and/or loss of altitude awareness, both of which have resulted in people being seriously injured or killed.

Many things need to be carefully considered before jumping with a camera on your helmet or fastened to your shoe or around your waist. Most concern is about snag points (lines, pilot chute, or bridle) and how to eject the camera if you have a problem (camera cutaway system). Many helmet manufactures have a built-in or retrofitted cutaway system for their helmet.

MYTH: *A GoPro™ is so small that it will not cause a problem.*
TRUTH: *Any size object can be a snag point. Size does not matter if it is a distraction.*

One of the biggest concerns for new video flyers, but not limited to them alone, is keeping track of the altitude, proximity, timing, etc. Too many videographers have died because they were so focused on getting the shot that they forgot what was going on in the skydive, including reading or listening to their altimeter (both a visual analogue and an audible altimeter are recommended).

There are specialised jumpsuits for videographers that contain small wings under the arm to help create a larger range of motion (slower fall rate); the size of the winglet depends on the size and mass of the jumper. Learning how to fly with a camera suit should be done separately from learning how to use a camera. Deploying improperly can result in a malfunction during opening.

It is highly recommended that you continue to learn about camera flying by reading **PIM 2C—Section 4: Camera Flying**, forum information at Dropzone.com (see link below), as well as speaking to professional dropzone camera flyers for advice on how to properly progress.

RESOURCES:

PIM 2C—SECTION 4: CAMERA FLYING, AVAILABLE AT:
CSPA.CA/EN/PIMS

DROPZONE.COM—PHOTOGRAPHY & VIDEO FORUM, AVAILABLE AT:
DROPZONE.COM/CGI-BIN/FORUM/GFORUM.CGI?FORUM=7;GUEST=127919555

SECTION 6 | Recreational Canopy Control Skills

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PREVIOUS: SECTION 5 | Recreational Freefall Skills
NEXT: SECTION 7 | Night Jump Endorsement

6.1 INTRODUCTION

In this section, you will find information about various canopy control techniques. It will also discuss information pertaining to the **Sport Canopy Endorsement** required for the A- and B-CoP.

Canopy control is perhaps the most important part of skydiving today. A safe skydive means you walk away after landing. Unfortunately, broken ankles, femurs, wrists, or worse are a frequent occurrence, often due to "pilot error". **Respect** for control of the canopy, and **jumping within your limits and abilities** will help you to have a long, healthy skydiving career. Disrespect, flying out of control, flying outside your abilities or licence level and, especially, disrespecting the instructions of senior coaches and instructors will result in an injury at best... death at the worst.

Please see the following note, "**USPA Calls for Jumpers to Learn More About Canopy Flight**" on canopy collisions.

PLEASE READ THE NEXT SECTION WITH THE SERIOUSNESS IT DESERVES.

▶ 6.1.1 CANOPY MALFUNCTION REVIEW

Now would be a good time to review canopy malfunctions. Reviewing malfunctions often will help you deal with most situations that can occur at opening. For some excellent video produced by the **Australian Parachute Federation**, see the resources below.

RESOURCES:
CUTAWAY!—APF MALFUNCTIONS TRAINING VIDEO, AVAILABLE AT:
YOUTUBE.COM/PLAYLIST?LIST=PLHDMFP89RAHBSZWLTEZKZ8WW-ERK7GCRTT

» GOOD CANOPY—VIDEO:
YOUTUBE.COM/WATCH?V=PTYSJH7DSVA&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=1

» ROUTINE OPENING PROBLEMS—VIDEO:
YOUTUBE.COM/WATCH?V=MZX3LN-LWOK&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=2

» DECISION MAKING PROCESS—VIDEO:
YOUTUBE.COM/WATCH?V=TSXYEBLNH_8&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=3

» EMERGENCY PROCEDURES—VIDEO:
YOUTUBE.COM/WATCH?V=YD1WE-F9-3C&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=4

» LOW-SPEED MALFUNCTIONS—VIDEO:
YOUTUBE.COM/WATCH?V=UL87CEO02L4&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=6

» HIGH-SPEED MALFUNCTIONS—VIDEO:
YOUTUBE.COM/WATCH?V=IBNF-HSD3MS&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=7

» TWO CANOPIES OUT—VIDEO:
YOUTUBE.COM/WATCH?V=S4X1PTLBF1Q&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=8

» TALKING TO YOUR INSTRUCTORS—VIDEO:
YOUTUBE.COM/WATCH?V=79TWUXK1Q2O&LIST=PLHDMFP89RAHBSZWLTEZKZ8WWERK7GCRTT&INDEX=9

The key thing to remember about canopy malfunctions is:

ASSESS **THINK** **REACT!**

For high-speed malfunctions, recognition is simpler but the decision-making and reaction must be faster. For low-speed malfunctions, the recognition is harder but there is a little more time. The stress here is that cutaway decisions should be made immediately, no later than the time to perform a canopy check. Remember to practise the normal scenario also, to be able to identify when to keep a canopy. Include line twists, collapsed end cells, slider hang-up, etc.

The names and identification of malfunctions and correctable situations is critical by this point. It is essential for you to practise going through the emergency procedures with the training vests or in a hanging harness.

* If there is any doubt whether you have a good canopy, let your hands go from the toggles, and go through your Emergency Procedures. If you have one of these conditions, you may in fact have a low speed malfunction. Take only 15 to 20 seconds to try to rectify the problem, and then carry out your Emergency Procedures if the problem persists.

SHOULD YOU CUTAWAY YOUR CANOPY?

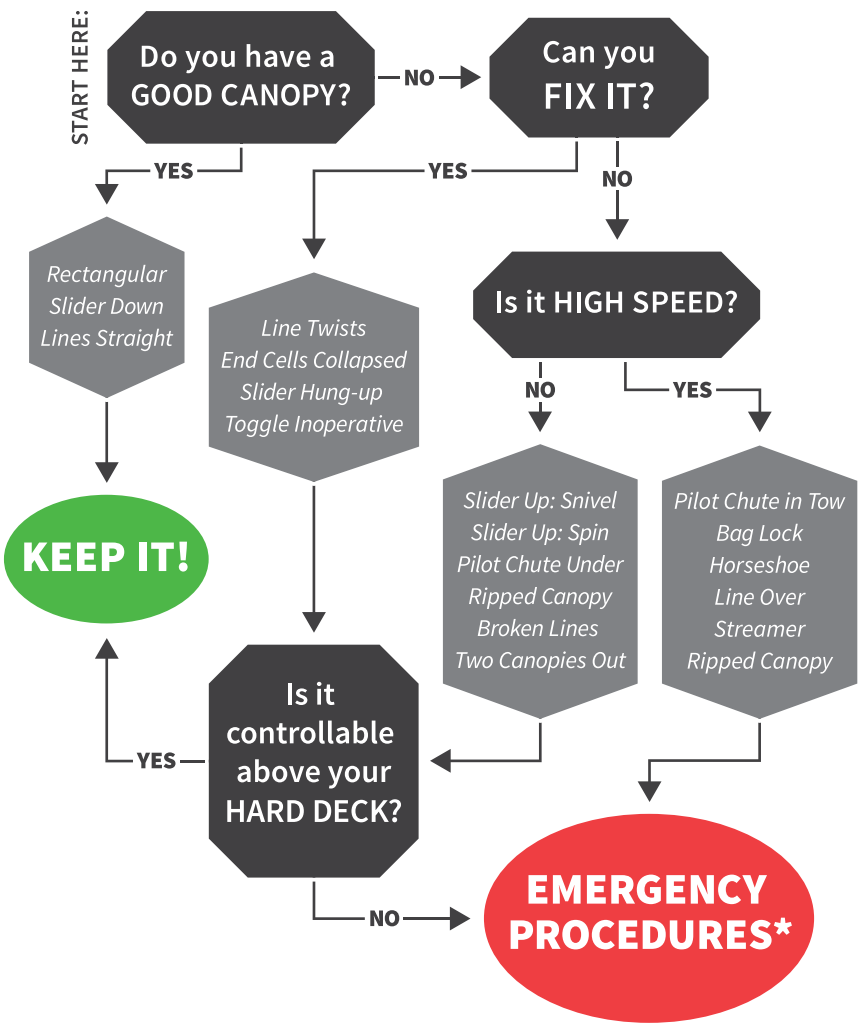


Figure 50: Cutaway Decision Flowchart

MALFUNCTION	SPEED	ACTION
Slider Up	Low Speed	Pump breaks. Corrected?
Line Twists	Low Speed	Pull risers apart. Kick out. How severe?
Bag Lock	High Speed	Emergency procedures.
Pilot Chute Under	Low Speed	Test. Keep, fly at half-brakes. Emergency procedures if necessary.
Line Over	Low Speed, Spinning	Emergency procedures.
Pilot Chute in Tow	High Speed	*Modified* Emergency procedures!
Total (Nothing Out)	High Speed	*Modified* Emergency procedures!
Two Out	Low Speed	Keep if steerable. Otherwise, emergency procedures.
Broken Line	Low Speed	Test airworthiness. Emergency procedures if necessary.
Broken Steering Line	Low Speed	Release both toggles, control with rear risers.
Ripped Canopy	Low or High Speed	Test airworthiness. Emergency procedures if necessary. A small hole is not a worry, a large gaping hole is a problem.
Streamer	High Speed	Emergency procedures.
Horseshoe	High Speed	Throw the pilot chute. Evaluate. Emergency procedures if necessary.
GOOD Canopy	—	Do a control check.

Figure 51: Malfunctions & Responsive Actions

2-OUT	CONFIGURATION	ACTION
Biplane	One canopy in front of the other.	**DO NOT CUTAWAY**. Gently pull on rear riser of FRONT canopy to steer. Hands off toggles completely. Land into the wind. Do not flare on landing—PLF.
Side-by-side	Canopies end-cell to end-cell.	If canopies are stable, keep them.* Control main canopy gently with rear risers. Hands off toggles completely. Land into the wind. Do not flare on landing—PLF. *If canopies separate, cutaway the main.
Downplane	Canopies try to fly away from each other.	Emergency procedures.
Pinwheel	Parachutes facing opposite directions, spinning around each other.	Emergency procedures.

Figure 52: Two Canopies Out

MALFUNCTIONS YOU CAN FIX

The first two listed here ("Line Twists" and "End Cells Collapsed") are the most common.

LINE TWISTS:

- Common due to student's body position on deployment.
- Pull risers apart, and kick legs to un-twist lines.
- Only when un-twisted, bring toggles smoothly down to "flare" position and back up again.
- (May not be rectangular if twists are severe.)
- (May not be controllable if it starts to spin wildly.)

END CELLS COLLAPSED:

- Somewhat common with lighter, smaller students.
- Bring toggles smoothly down to "flare" position and back up again. Do it twice to make sure.
- Also, do a gentle turn to the left, gentle turn to the right to inflate.
- (May not be rectangular if the cells are not inflated.)
- (May not be symmetrical if one side is closed.)

SLIDER UP:

- The correct position is directly at the top of the risers.
- Bring toggles smoothly down to "flare" position and back up again. Do it twice to make sure.
- (May not be rectangular if slider has stayed up the lines.)

TOGGLE INOPERATIVE:

After releasing your brakes, if the toggle seems not to be functioning properly, pull it twice to make sure. If one toggle cannot be released, or is malfunctioning in any way, a turn can be corrected by counter-steering with the opposite toggle. Attempt to counter a turn with the toggle no lower than your head.

If one toggle or steering line has broken, steering your canopy can be accomplished with the rear risers. The toggles are connected to the rear corners of the parachute, the risers are connected to the rear halves of the parachute.

Also, remember that these simple malfunctions may occur in pairs. You may experience "Line Twists", then after untwisting them, you may have "End Cells Collapsed" or "Slider Up".

If there is any doubt whether you have a good canopy, let your hands go from the toggles, and go through your Emergency Procedures. If you have one of these conditions, you may in fact have a low speed malfunction. Take only 15 to 20 seconds to try to rectify the problem, and then carry out your emergency procedures if the problem persists.

MODIFIED EMERGENCY PROCEDURES:

It is recommended that you sit down with and discuss modified Emergency Procedures with an SSI or senior instructor. For instance, if you are experiencing a "Total Malfunction" (e.g. cannot find the pilot chute), then you should go directly to the reserve handle (not the cutaway handle) to save precious time and altitude.

MALFUNCTION CHARACTERISTICS

High-Speed Malfunction Characteristics—Windy and noisy. May not be able to see parachute.

It is called a high-speed malfunction, because there is NO canopy over your head. It takes 20 seconds or less to fall from your parachute opening altitude with no parachute. Go through your emergency procedures as soon as you recognise a high-speed malfunction.

Low-Speed Malfunction Characteristics—Windy and noisy. Spinning sensation, you may feel dizziness or nausea. Parachute is not properly inflated above your head.

It is called a low-speed malfunction because there IS a canopy over your head, but depending on the type of malfunction, you may be spinning very quickly. The jumper will reach the ground in 2 minutes or less. You will very likely be seriously injured if you do not Assess—Think—React quickly. Release your hands from the toggles and go through your emergency procedures as soon as you recognise a low speed malfunction that cannot be corrected.

TIME CHECK

4 Seconds—Approx. time for parachute to open (depending on canopy characteristics).
2 Seconds—Approx. time to recognize a high speed malfunction.
2 Seconds—Approx. time to perform emergency procedures.
+ **2 Seconds**—Approx. time for reserve to deploy.

=10 SECONDS TOTAL TIME

You have a limited amount of time, but more than enough if you act promptly and decisively. Once decision is made to perform Emergency Procedures, remember to let hands go from toggles first. (Your dropzone may have different procedures that you should follow.)

HARD ARCH—*Provides proper body positioning for reserve deployment.*

LOOK—*At the cutaway handle and reserve handle, as they may have moved. You do not want to blindly pull on the harness.*

REACH—*For the cutaway handle(with one or both hands, depending on your DZ).*

PULL RIGHT—*The cutaway handle with one/both hands, straight down to full arm's length.*

PULL LEFT—*The reserve handle with one/both hands, straight down to full arm's length.*

CHECK—*The reserve canopy.*

RSLs and AADs have limitations, and you need to be aware of the situations where these devices can be a disadvantage (i.e. spinning malfunctions, prolonged level flights, etc.). Speak with senior instructors about other limitations.

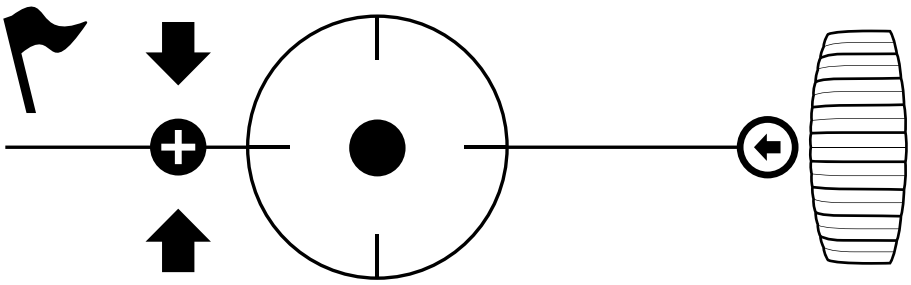
6.2 ASSESSING A CANOPY APPROACH

This skill is developed by spending time watching experienced and not so experienced jumpers make approaches into the target area. To develop this observational skill, learn a series of points to check to assess the approach (as suggested below) and learn where to stand at the target in order to get the best view of the approach.

The points that you should consider are:

- Body and canopy approach configuration (set at half brakes allowing for more or less brake if required)
- Height at start of approach (should be 500 to 300 ft. vertical)
- Distance behind target when set-up (500 to 300 ft. horizontal)
- Variations of the surface wind (movement of the windsock)
- Consistency in **line control** of the approach
- Consistency in **angle control** of the approach
- Consistency of body position, or alignment of jumper/canopy
- Continuation of control or flight all the way to the ground

Evaluating canopy approach: You may want to sit with a coach while watching a few approaches. At first, try to identify things that are done well and those that could be improved. Later, you should be able to point these things out on your own.



*The "+" is the point that does not "move".

Figure 53: Line Control Approach

6.3 AVOIDANCE TECHNIQUES

This is practice of awareness and reaction time in the prevention of mid-air canopy collisions after an FS jump. You should practise this exercise with both right and left riser turns when you are doing beginning FS and on solos.

Avoidance techniques are achieved by doing a 90° riser turn in one direction, defaulting to the right for head-on (but situation dependent for all others) immediately after opening.

Avoidance techniques are important for safety during FS. If there are two canopies flying **directly towards each other** after opening, both should initiate a **90° right turn** to avoid collision. This only applies to direct-facing canopies. All other situations must be quickly assessed for the best turn (left or right) in order to avoid a collision. For turning immediately after opening, the risers are used; unstowing the steering toggles can cost time and increase canopy forward speed, speeding up a dangerous situation. Use the rear risers to turn immediately and slowly at the same time; the front risers will creating a diving turn and increased speed.

You should review the "Right of Way Rules" found under the Canopy Control §6.9 and §6.16 of **PIM 2A**.

▶ 6.3.1 FACTORS AFFECTING HUMAN PERFORMANCE

Items that can influence human performance are:

- Lack of Communication
- Complacency
- Lack of Knowledge
- Distraction
- Fatigue
- Lack of Awareness

Lack of Communication—There should be a method to communicate on the ground and in the aircraft about the landing direction, the landing approach zone (pattern), and direction (left or right pattern). This depends on the winds of the day and the obstacles that come into play based on the wind direction). An example of good communication would be a sign on the ground at the boarding area indicating the landing pattern, combined with a pre-boarding briefing, and a picture of the landing area in the plane.

Complacency—Defined as "self-satisfaction accompanied by a loss of awareness of the danger." If an activity has become routine and you become lazy, you may be missing important signs. There is a tendency to see what you expect to see. Each jump should be considered a first jump, and good briefing will help avoid complacency.

Lack of Knowledge—Skydivers have a responsibility to ensure that they have the required training before attempting any skill, or using any equipment (e.g. downsizing a canopy). Are you aware of the flight characteristics of your canopy? How does the canopy respond to a flare? Stall Point? Flat turn? PIM 2A, coaches, and reference manuals are good information sources.

Distraction—This is anything that draws your attention away from the task, which is to land safely. Psychologists say distraction is the number one cause of forgetting things. Make sure other portions of your skydive do not distract you from what you are doing at the moment. The debriefing is the time to review, not now. Keep your concentration on what you do as you do it.

Fatigue—Studies have shown that, similar to being under the influence of alcohol, we tend to underestimate the problem and overestimate our ability to cope with it. These studies have proven that after 17 hours of wakefulness, you are functioning as if you had an equivalent blood alcohol level of 0.05%. After 24 hours, the level increases to 0.1%; a very sobering thought. The more fatigued you are, the lower your IQ. It is also noteworthy that the more fatigued you are, the more easily you are distracted.

Lack of Awareness—Defined as "a failure to recognise all the consequences of an action, or lack of foresight". To combat this, try asking yourself, "What if... do I see the complete picture?" Have you planned your canopy approach well in advance, or too late? Do you have an "out" just in case of canopy conversion? Alternatively, how will you react if you discover you have approached the final turn too low?

6.4 ASSESSING WEATHER

This skill is developed over time by looking at the weather, watching canopies fly in different weather conditions, reading books about flying, listening to weather forecasts (aviation forecasts), and talking with experienced jumpers.

Some of the key elements to consider while learning how to assess the weather are:

- Are conditions stable or changing? If changing, how quickly?
- From what direction is the wind coming? Is it steady or variable?
- Is the airflow at altitude the same as the surface winds?
- Is there cloud or haze that will create a visibility problem at altitude?
- Do the reports suggest there is a front or storms in the area?

You will want to be informed about the usual conditions and problems that may be encountered at your DZ. Remember to identify the best indicators (e.g. clouds over the lake or wind direction) which precede bad weather. Ask the pilot for the PIREPS (pilot report) weather reported by pilots. Try to have a phone number for the local weather office, or get the current weather reports from your computer; a weather briefing should be given at the start of the day.

RESOURCES:

CANADIAN AVIATION METEOROLOGICAL INFORMATION, LEARN MORE AT:
NAVCANADA.CA/EN/MEDIA/PUBLICATIONS/AWS-GUIDE-EN.PDF

FORECASTS AND OBSERVATIONS—METAR & TAF, AVAILABLE AT:
FLIGHTPLANNING.NAVCANADA.CA/CGI-BIN/CREEPAGE.PL?LANGUE=ANGLAIS&NOSESSION=NS_INCONNU&PAGE=-FORE-OBS%2FMETAR-TAF-MAP&TYPEDOC=HTML

UPPER WINDS—FORECASTS 3000' TO 18000', AVAILABLE AT:
FLIGHTPLANNING.NAVCANADA.CA/CGI-BIN/CREEPAGE.PL?LANGUE=ANGLAIS&NOSESSION=NS_INCONNU&PAGE=-FORE-OBS%2FFD-TEXT&TYPEDOC=HTML

6.5 ASSESSING TERRAIN

The skill of assessing terrain provides two types of useful information. The first relates to the canopy flight and identifying areas of rising and descending air. The second relates to landing the canopy. It is important to be able to identify areas of smooth airflow for safe landings, while recognizing areas of turbulence that should be avoided. Local coaches are your best source of information about turbulent areas. Keep in mind that turbulence depends on wind direction and strength.

In general, dark coloured surfaces and developed property (buildings and paved areas) are sources for hot rising air on a sunny day. The air above lakes, trees, swamps, and grasslands is most often cooler and more stable, or descending. In addition, a change in level such as a ridge or some small hills will cause the air currents to be moving upward.

TIP: TURBULENCE

TURBULENCE IS ASSOCIATED WITH THE MIXING OF TWO AIRFLOWS OR DISRUPTION OF THE AIRFLOW.

Mechanical Turbulence is the result of features on the earth's surface such as a large building (high- rise or a hangar) or natural features such as a hill or a tall line of trees. The airflow in front (upwind) of these types of features is quite stable. Behind or downwind from such a feature the air is tumbling or circling (also called "rotors" or "rollers"). This is a very dangerous place to attempt to land one's parachute. Avoid landing immediately downwind of large buildings, tree lines, etc. Similarly, the airflow just back of the top of a ridge or small hill is quite turbulent; landing in that area should also be avoided.

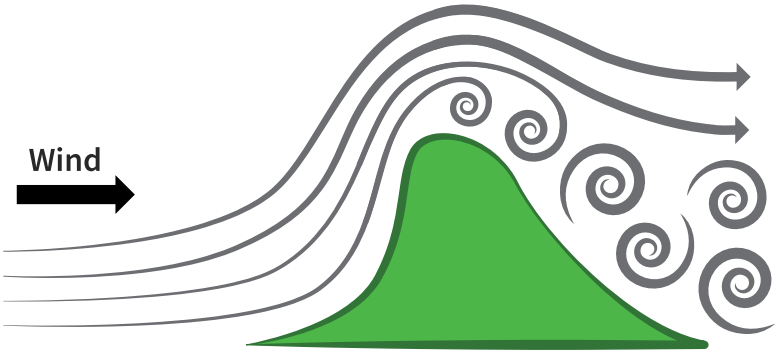


Figure 54: Turbulence Downwind of Obstacles

Another form of turbulence to be cautious with is **Wake Turbulence**. This turbulence forms in the flight path behind a parachute or an aircraft as it travels through the air up and behind the canopy at approximately 45˚. It can be very dangerous to cross the wake of another parachute or aircraft when coming in for a landing because it can collapse your canopy.

RESOURCES:

CANOPY CONTROL—COLLAPSES AND TURBULENCE, AVAILABLE AT:
DROPZONE.COM/SAFETY/CANOPY_CONTROL/COLLAPSES_AND_TURBULENCE_619.HTML

6.6 FS LANDING APPROACH

Once your canopy is open, you must be aware of other jumpers flying their canopies near you, particularly after a formation jump. As an example, if you were on a 4-way dive, then you should be able to spot the other three skydivers under their canopies. If you are close to other canopies, move away from them to practise your canopy skills. As the canopy altitude decreases, there will be more jumpers flying their canopies in a smaller space. Make sure you know where they are. When in the air with several other jumpers, it is best to obtain some vertical separation with other jumpers. This will make final approach and landing easier. If you are above someone under canopy, maintain that vertical separation by applying ¼ brakes to create some lift. If you are at the same level, one of you should make the decision to lose some altitude. Full flight, front riser, or sashay; avoid S-turns in the landing circuit as this could interfere with traffic behind you. The earlier you recognise a conflict may occur, the better and more time you both will have to resolve it.

CAUTION: *Vertical separation should only be used by the lower canopy if altitude permits. Avoid flying over top of another canopy.*

Additional rules are as follows:

- If your canopy converges with another, the canopy on the right has the right of way.
- Yield to lower canopies, less manoeuvrable canopies, reserves, tandems, camera persons, canopy formation flights (CFS), and students.
- If you get behind another canopy, immediately move off to the side to prevent canopy collapse due to turbulence.
- Look in the direction you wish to turn before you turn. If it is clear, make the turn.
- Do not perform any radical manoeuvres.
- If you are on final, do not S-turn or brake hard. There are probably other people behind you, and you could cause a collision.
- If the landing area is too congested, choose another site.
- Yield to canopies that have already landed, and if you are landing close to them give them a shout.
- Once on the ground collapse your canopy immediately and clear the landing area so others do not have to deal with a congestion problem. Watch for other canopies.

These are the general rules of the air, but remember situations may arise that dictate the use of other actions.

6.7 GROUP PATTERN APPROACH

On larger FS or VFS jumps, it is often difficult to gain vertical separation from everyone. There are a few rules to follow for these situations. Follow the avoidance techniques discussed above. It is advisable that all jumpers follow a landing pattern during the downwind leg and landing approach. This keeps an organised pattern for landing and prevents canopy collisions. The most common landing pattern is the left-hand pattern, but others may exist to keep canopy traffic away from runways or high turbulence areas. Find out which circuit pattern is used at your DZ!

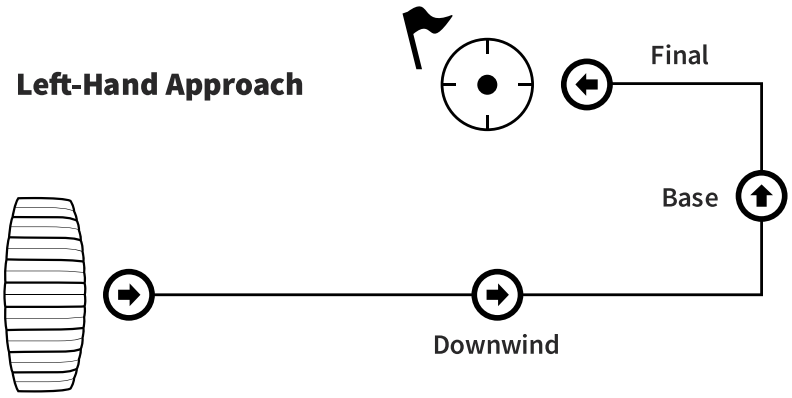


Figure 55: Controlled Landing Approach

To enter the landing pattern, converge with other canopies on the downwind leg of the landing pattern before passing the landing area. Fly the canopy at full flight unless there are problems in front of you. Remember there are other canopies behind you. If you are the inside canopy on the base leg turn, turn a little earlier than normal to give the outside canopy at chance to reach the landing area. When on final DO NOT set up for an accuracy approach or do any wide side to side turns. This may cause canopy collisions! Fly your canopy at full flight to the ground and flare. Clear the landing area after landing. Watch out for other canopies landing.

6.8 CANOPY CONTROL TECHNICAL KNOWLEDGE

▶ 6.8.1 MODEL FOR AN ACCURACY APPROACH—TRADITIONAL[14]

This information is provided to perform solo accuracy at the "bowl" or "tuffet"; it should not to be used during a group pattern approach or in a high traffic area. The essential element of the accuracy approach is the "final approach" to the target. It is a combination of body position, line control, and angle control. The final approach is flown from a position somewhat downwind of the target to the centre of the target. Final approach should begin at roughly 500' above the ground; experienced accuracy jumpers will often start their final approach at a lower height. Minor variations can be accommodated by manoeuvres as shown in the diagram below.

14 Accuracy by Craig Winning, Canpara©, Canadian Sport Parachuting Association, 1980.

The objective for the accuracy approach is to fly a straight line from the set-up point to the centre of the target, moving forward at a constant speed. The speed of the approach should be about 4 mph, about equal to a normal walking speed. The canopy should be flown with a brake position that can be increased to slow the canopy's flight, or decreased to speed the canopy's flight. The body suspended below the canopy should be virtually motionless, with the hands level (about ½ to ¾ brakes); the torso should be relaxed and square with the canopy. Rocking below the canopy or twisting relative to the canopy's direction of flight will give incorrect impressions of the actual motion. Fly the canopy all the way to the ground, placing the feet below you when you land. Reaching encourages you to stop flying the canopy several feet above the ground and generally causes injuries.

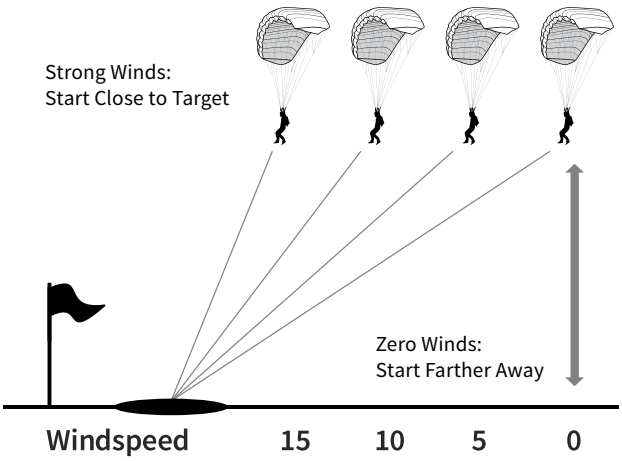


Figure 56: Windspeed & Landing

In the time between exit and the start of the final approach, do the following things:

- Perform a flight control check, including stall point.
- Observe the surface winds, select a starting point for the final approach (perform a wind penetration check at ~1200 feet).
- Drift the canopy towards that point while relaxing; rest the arms.

Under canopy, you can ask yourself this series of questions as you make your approach:

- Is the canopy on line to the centre of the target? (Check the wind sock.)
- Can the canopy land short of the centre? Fly over the centre?
- Is my body position square with the canopy and relaxed?
- Am I still flying to the ground? Keep flying!

It should be reiterated that S-turns are for student practice, not for normal approach to final, as this could interfere with other canopies turning onto final behind you. See **Exercise 2 – Practice solo jumps with a final approach at 2500+**.

There are no secrets or tricks to the accuracy approach. It is a matter of moving slowly closer to the target, making small corrections as you watch where you are going. This type of accuracy approach is for individuals with accuracy canopies.

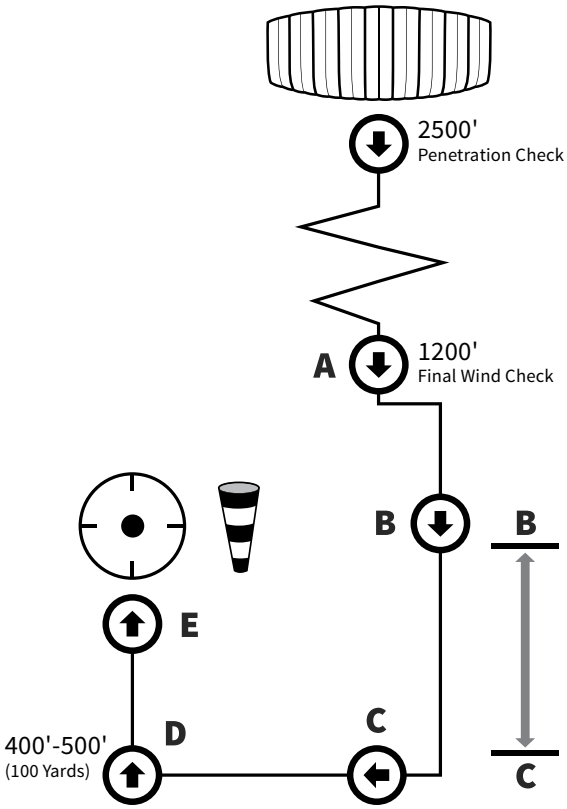


Figure 57: Accuracy Approach

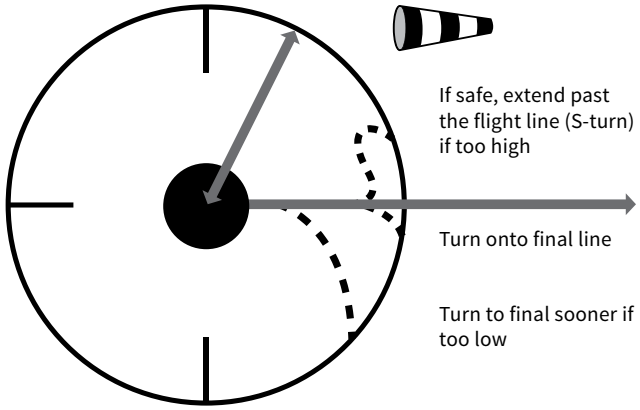


Figure 58: S-Turns

▶ 6.8.2 MODEL FOR AN ACCURACY APPROACH—SPORT CANOPIES[15]

UNDERSTANDING THE TARGET MOVING "UP" OR "DOWN"

This concept has been explained over and over again—and you probably have heard it already.

As you descend under parachute, the horizon appears to be rising in your field of view. Since you can never reach the horizon, you can assume that objects rising in your field of view are unreachable—you are undershooting them.

If you look down, as you fly over objects on the ground, they appear to move down relative to your field of view. You are overshooting those objects, so you can also assume that an object moving down in your field of view means you are overshooting it.

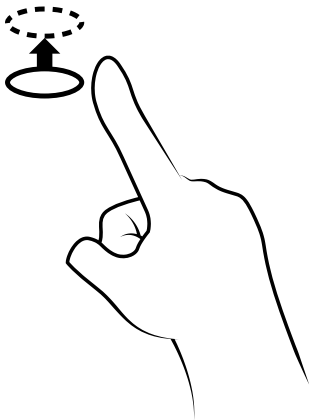


Figure 59: Target Appears to Move Up

15 Hayes, David "TK". (2007). "TK's Accuracy Seminar". Used with permission.

It can help if you use your finger, extended at arm's length, held against a distant object: close one eye, and then watch the movement of the object relative to your fingertip.

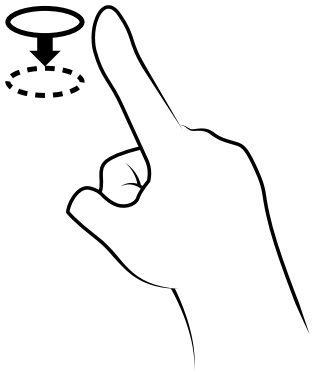


Figure 60: Target Appears to Move Down

If the object is rising relative to your finger, then you are **undershooting** it. If the object is falling relative to your finger, then you are **overshooting** it; the target appears to move down. You will fly over and past the target.

It is far easier to see overshooting than undershooting. Distant objects hardly appear to move at all, (smaller slight movement), while objects closer to you (overshooting) is more obvious since the objects are closer to you.

Somewhere in the middle of the picture is a spot that is not moving at all. If the winds stay the same and you never change direction of your parachute, then that is where you will likely land. However, this is not exactly where you **want** to land. The purpose is to make your **intended** target this 'non-moving spot'.

THE SAFETY SIDE OF THE ACCURACY TRICK

Making it back to the DZ. One of the neatest things about this concept is that it works at any altitude, distance, wind speed, and/or under any parachute. We have all opened our parachutes a long way from the dropzone, looked back at the DZ and wondered if we can actually make it home.

So, as soon as you open, check your parachute, and start heading back to the landing area, look at where you want to land (the finger trick works). If you see the landing area moving down in your field of view, then it means you are overshooting it, i.e. you can make it home. (Barring any radical changes in wind or your flight path, like spirals, etc.) If you see the landing area rising, then you are undershooting it, i.e. you cannot make it home.

Can you improve the situation if you are undershooting from a long spot? **Yes**, most definitely. Almost all parachutes these days (Zero-P and 9-cells) will float or carry farther, if you either put some brakes on or use rear risers to add some lift. Large parachutes (students and such) are difficult to rear-riser due to the size and strength it takes to do so. A slight application of brakes (ear or shoulder level) will improve the glide ratio, sacrificing only a small bit of forward speed. This is a general rule for parachutes, but may vary depending on the parachute.

The best way to find out the best flying configuration for any given parachute is to talk to the manufacturer of the parachute. They have done hundreds and thousands of test jumps, and can best offer the right information. Most publish the flight characteristics of the canopies, which offer great information and should be studied.

Back to solving the real problem of getting home to the DZ. If you are undershooting your landing area, then try some brakes. If you can then see the dropzone "moving down" in the field of view, then you have much improved your situation, and staying in brakes for a period of time should help you to make it home.

Why? Because it is simply smarter to land in the normal landing area if you can. Landing off the DZ simply introduces more obstacles, unknown landing areas, and therefore higher risk, etc.

If you have applied brakes and you are still sinking relative to the dropzone, then you need to make a decision to land somewhere other than the dropzone, but closer to you. This is an OK decision too. The point being that you can make this decision within 15-20 seconds of opening your parachute, giving you more time and opportunity to choose an "out" landing area.

In conclusion, the accuracy trick should be used every jump, as soon as you open. Verify your position relative to the DZ and decide immediately if you can make it back or not. Then make the decision to land out if needed, maximizing your time to pick the landing spot and set up for a good safe approach.

TEACHING & LEARNING "REAL ACCURACY"

The objective of this learning process is to make better decisions on the downwind and downwind/base leg of your canopy flight.

The figure to the right shows a good example of a typical downwind–base–final approach. These techniques can help you make a better decision on your pattern based on your altitude and the winds, but mostly based on **which way** the intended target is moving relative to your field of view.

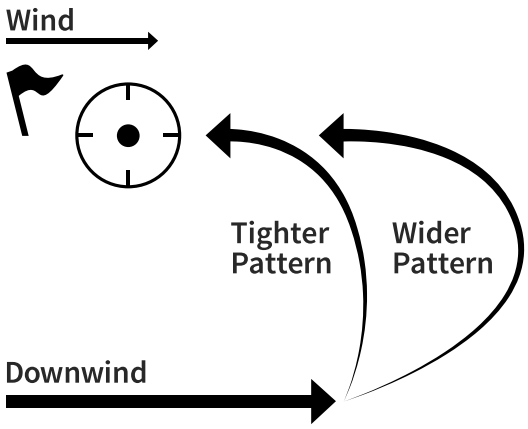


Figure 61: Decision Time—Wider or Tighter?

EXERCISE 1—WATCH OBSTACLES ON THE GROUND:

During any point of your canopy flight, you can simply pick obstacles on the ground in front (or off to the side) of you, and watch them for up or down movement. A building, a barn, a hangar, or a tree. Watch objects closer and farther away. Use your fingertip if you need to and watch each obstacle for a few seconds to see the movement.

Again, farther objects have less and smaller movement than closer objects. The purpose of the exercise is repetition to train your eye. Perform this each skydive during your flight home. An object need not be right in front of you to see this movement. Look at things that are off to the side of your flight path. Do you see them moving down?

EXERCISE 2—PRACTICE SOLO JUMPS WITH A FINAL APPROACH AT 2500'+:

Normally we fly to a holding area (upwind of target), then enter a base leg to a final approach point (200'-300').

A good exercise is to open and check your canopy, then immediately fly to the final approach point, and set up for a final approach, but say at 2500'. You will overshoot of course. Again, the purpose here is to train your eye to see the downward movement of the target as you overshoot it.

Line up on the wind line as best you can, and the moment you recognise and see the target moving down, do a Figure-8 or S-turn and come back to the final approach point again. Stop and watch the target. Again, it will be moving down, and repeat the S-turn again.

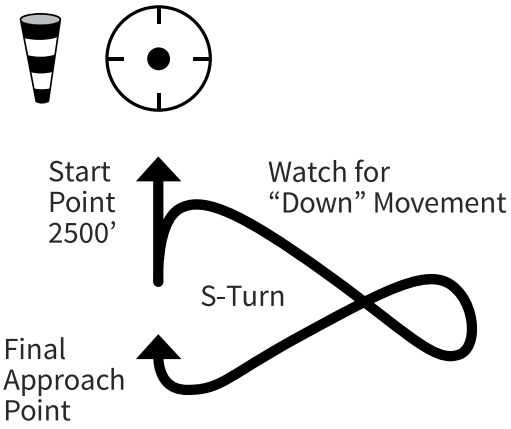


Figure 62: S-Turn Practice

The purpose here is that you can practise your final approach 3-5 times on each jump, rather than just once. Set up at 2500', then 2000', then 1500', etc., until you are at an altitude where you need to stop turning and fly straight in to final for landing.

We are not asking you to do anything here that makes you uncomfortable, like low turns. Depending on your experience level, it could be 500' when you stop the exercise. Fly and land normally.

You will already be closer to the target than you ever have been before—since this is the first time you really focused on the target itself and its movement. As well, each time you see yourself overshooting (downward movement of the target), do an S-turn to burn off altitude.

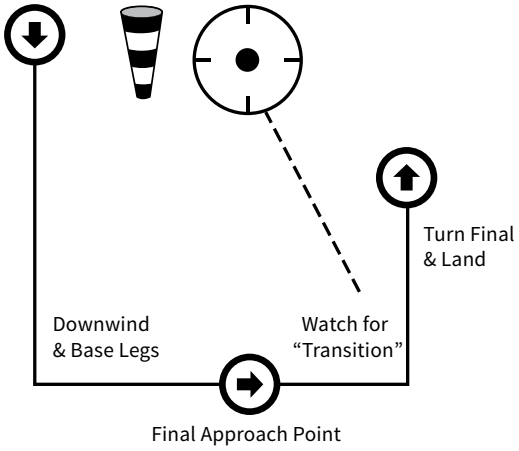


Figure 63: Learning the "Transition"

Most people need to do this exercise for 2-5 jumps to train their eye, meaning you will do 6-15 approaches total.

> **CAUTION:** *This is not an acceptable way to fly your parachute normally in the landing pattern with other canopies in the air. This exercise is only for the purposes of training your eye further to see the target movement.*

EXERCISE 3—RECOGNIZING THE TRANSITION ON BASE LEG:

The up/down movement occurs whether you are flying directly at the target, flying away from it, or flying alongside of it.

During this exercise, fly a normal landing pattern, turn your downwind to base leg, and then watch the target. It should be moving down relative to you (overshooting); continue to fly the base leg, but watch the target. Eventually, you will be flying away from the target, which also means that eventually the target will begin to "move up" in your field of view (undershooting).

In order for the target to go from moving down to moving up again, it has to go through "zero", or the point of no movement. The whole point of this exercise is to train your eye to see the transition from overshooting to undershooting.

When you see the transition of the target moving up, then simply do a turn to final and land. Ensure that you have "outs" when you do the final turns, since you may not be in line with the target when you turn. What you will find is that you are pretty much landing in line with the intended target.

Again, for this exercise, **no radical turns**, nothing too low or stupid. We are not trying to scare you, just get you to recognise the transition from downward to upward movement of the target.

EXERCISE 4—GO FOR THE TARGET:

The final step is to go for the target when you see the transition from "target moving down" to "target moving up".

Diagrams of landing patterns showing nice 90 degree turns from downwind to base to final are nice, but the fact is that we do not fly our parachutes like that. We fly with much smoother curves and turns throughout the pattern.

If you are on the downwind leg, watching the target, and you see the target suddenly move up and away from you, then you need to "cut the corner" and close the distance between you and the target. Figure 64 shows a good example of that.

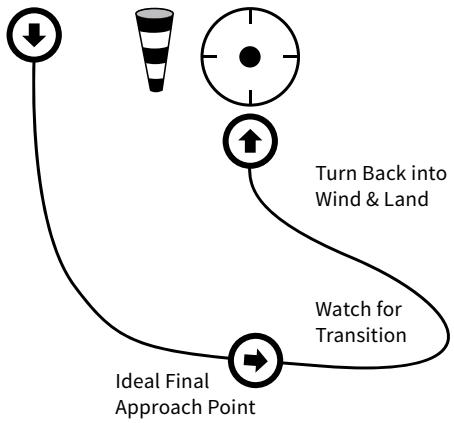


Figure 64: Wide Final

If you are already on your base leg, and you reach what you think is the "Ideal Final Approach Point", but the target is still moving down, then continue to fly a little farther or fly a wider pattern until you again see the transition.

You can then turn more than 90 degrees, come back to the target, correct into the wind and land. What you will find, over time, is that the target will become the spot that "never moves", especially

during the downwind Figure 63 example of a "Wide" base–to–final to base leg of your flight.

You will simply automatically adjust your flight path by paying attention to the movement of the target. Is target moving up and away? Move closer to it. Is target moving down and under? Move farther away from it.

With practice, you will get to the objective described in Figure 59: "Target Appears to Move Up"; making a better decision on the downwind-base leg of needing a wider, or tighter pattern to still land on the target.

COMMON MISTAKE

Overshooting on final: Students, low-time jumpers, and for that matter, a large number of experienced jumpers tend to overshoot their targets. The mistake they often make is to put brakes on to slow down, thinking they will land shorter. We already discussed in the section about "Making it Back to the DZ", that adding brakes makes you go farther by adding lift when travelling with the wind.

It cannot be stressed enough that if you are overshooting, then you have to **increase the distance** between you and that target. Moreover, you can only accomplish that by making a turn, even slightly, away from the target.

Yes, some parachutes are designed to "sink" in deep brakes, but these are advanced topics using specialised parachutes like the Parafoil, Accutron, and several other accuracy canopies. Do not try deep breaks in your canopy near the ground in case it stalls; Only practise these above 2000'.

For most skydivers, jumping 9-cell Zero-P canopies, moving away from the target is the simplest manoeuver. If you have any moderate wind, that can be as simple as a slight sideways turn, allowing the wind to push you farther from the target, until you see the "transition" again and turn back on target.

LAND ANY PARACHUTE, ANYWHERE, ANYTIME

Throughout the exercises, we have yet to talk about what size of parachute we are jumping or wing loading. Nor have talked about wind speed. That is because these issues do not enter into it. Whether the winds are high or light, large or small parachutes, the technique is the same. The spot that is "not moving" is still the spot on which you will land.

What you will find is that larger parachutes on high wind days will cause the target to "move up" more quickly when you are on downwind–to–base leg, therefore you will have to stay closer to the target to keep it from moving.

In addition, if you jump some hot-rod high performance parachute, you will find on your base leg that you are still overshooting; so you have to move farther away, probably farther than usual. However, the target will eventually begin to "move up", and then you turn to final.

For advanced canopy pilots, you will also find that high performance hook turns may still cause you to overshoot the target, generally due to the increased lift and glide generated by the parachute at high rates of speed.

Therefore, you may build in a minor delay to adjust for that before you turn to final, i.e. the target begins to move up, wait 1 second... 2 seconds... then hook-it, swoop down, and level out short of the target but gliding over it.

The bottom line is that if you use this technique to train your eyes to see the movement, your hands will begin to adjust automatically using the toggles to keep your position relative to the target. To land any parachute, anywhere, anytime.

RESOURCES:

KNOW HOW TO GET THE BEST PERFORMANCE FROM YOUR CANOPY?
PERFORMANCEDESIGNS.COM/DOCS/BEST_PERFORMANCE1.PDF

EXAMPLE—PD SABRE 2 FLIGHT CHARACTERISTICS, AVAILABLE AT:
PERFORMANCEDESIGNS.COM/DOCS/SABRE2-FLIGHT.PDF

EXAMPLE—PD RESERVE FLIGHT CHARACTERISTICS, AVAILABLE AT:
PERFORMANCEDESIGNS.COM/DOCS/RESERVE-FLIGHT-CHAR-V3.PDF

*Special thanks to David "TK" Hayes from Skydive City, Zepherhills, FL, for writing this article and for allowing it to be used in this publication.[16]

16 bpa.org.uk/assets/Training/Canopy-handling/Survival-Skills.pdf

SECTION 7 | Night Jump Endorsement

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PREVIOUS: SECTION 6 | Recreational Canopy Control Skills
NEXT: SECTION 8 | Water Jumping Endorsement

7.1 INTRODUCTION

Night jumps, like any other form of skydiving, can be a unique and enjoyable experience when properly planned. Night jumps are carried out during night VFR conditions, and occur between one hour after official sunset and one hour before official sunrise. Night jumping requires special preparation, training and increased vigilance for several reasons: reduced vision; increased stress of a new environment; increased responsibility on the jumper; challenging landing due to reduced visibility. Overcoming these challenges is what makes night jumps interesting and memorable.

RESOURCES:
CSPA—NIGHT JUMP REQUIREMENTS, AVAILABLE AT:
CSPA.CA/EN/NIGHT-JUMP

CSPA—TECHNICAL RECOMMENDATIONS, AVAILABLE AT:
CSPA.CA/EN/SAFETY/TECHNICAL-RECOMMENDATIONS

7.2 THE JUMP

PREPARATION:

A great deal of consideration and thought should be put into night jumps so that the event goes off smoothly and safely. As per **BSR** #1, a night jump endorsement is a requirement. Please read §3.2 and 3.17 **PIM 1** for the specific recommendations regarding night jumps.

1. Plan night jumps when the moon is greater than half full and the air temperature is moderately comfortable (in case you become lost). Check the weather website or weather office for upper winds and possible changes in the weather—you cannot see a storm coming at night. Winds must be <10 mph for the entire canopy ride.

2. Prepare all equipment prior to the jump and ensure that it is functional (e.g. ground lights for landing area and on obstacles, instrument lights, aircraft, extra chemical lights on board the aircraft in case one malfunctions, ground-to-air radio, night wind drift, ground radios or cell phones).

3. A night jump briefing, by the DZSO or designate, should occur before the event to ensure that each person is aware of his or her responsibilities. This also allows junior jumpers the chance to become familiar with the event and ask questions. Topics covered in the briefing should include the sequence of events, signals (target lights on, off, flashing), reduced vision, emergency procedures, landing pattern, and announcing your return.

    - First time night jumpers, regardless of CoP, are recommended to perform a maximum delay of 20 seconds.

4. Have the ground crew set up the landing area and ensure that jumpers are aware of the lighting layout. Do not change anything afterwards. For night accuracy, use a light (chem light) under the disk.

5. Allow 30 min for night vision adaption. During this time avoid exposure to bright lights as this reduces night vision. Rods, which are the low light sensors for night vision, are situated around the outside of the center of the retina. Therefore, the clearest image is obtained by looking slightly to one side of an object. (Keep open fires away from the boarding and landing area.)

6. Smoking: Carbon monoxide in the blood reduces the level of oxygen in the blood thus reducing night vision. It also increases the chance of hypoxia. Avoid smoking until after you have landed.

7. Plan dirt dives that are within the normal daytime skill/experience. When planning Formation Skydiving attempt to use formations which allow each person good visibility of others. Do not plan overly complex dives—keep it simple.

8. Perform a safety check of all equipment… multiple times!

9. Assign a Load Master to each load who is an experienced night jumper, especially for a group of first night jumpers.

10. Stay within your skill limits. Do not try anything new without proper daytime training.

11. **IMPORTANT**: All jumpers should be told to check in with the ground controller after landing. This ensures that all jumpers are safely back; ground crew might not be able to see if someone lands off. Strongly consider carrying a cell phone and a list of important phone numbers.

IN-FLIGHT

1. Helmet lights or other instrument lights need to be covered up during the aircraft ride, as they will reduce night vision of both the jumpers and the pilot. Never shine any light in front of the pilot's eyes.

2. Orient all jumpers prior to exit; all should be able to identify the DZ and the landing area at altitude.

3. If using a WDI, drop a night WDI—ground crew should light up its landing position. A rate one turn at altitude may be useful to judge upper winds.

4. Carefully observe the wind strength and direction when spotting. Pay particular attention to upper winds, as they are generally stronger than the ground winds.

5. Be especially careful during climbout as reduced vision may create problems of equipment snagging; ensure you have good grips.

6. Inexperienced night jumpers doing delays should exit on separate passes, or at 5-10 second intervals with staggered opening altitudes. A minimum of a 2 minute go around is required for separate passes. People should be advised **NOT** to spiral below a previous jumper.

FREEFALL

1. Be aware of other individuals in freefall. Also, remember, your friends cannot help you if they cannot see you.

2. Remember: altitude awareness!

3. Tracking after break-off from group FS is the best method of ensuring that adequate separation for canopy opening is obtained.

4. If this is your first night jump, you must jump **solo** to allow you to work on your own relaxation, altitude awareness, and main activation skills. This will also give you an opportunity to orientate yourself to your new surroundings, relax, and enjoy your first night dive.

CANOPY CONTROL

1. Check your canopy (e.g. before releasing brakes) and perform a flight check.

2. If other canopies are in the air, **do not perform spirals** as your ability to see below is compromised. Every turn you do increases the chance of a mid-air collision.

3. Continually monitor canopy drift as you descend. It is very common at night to encounter unexpected layers of wind that were not present in daytime.

4. Maintain a traffic pattern below 1000' for minimum canopy interference prior to landing. Ensure that everyone uses the same pattern for your DZ.

5. Keep a sharp lookout for other canopies; if you believe that another canopy is too close, shout to warn that person. They may not see you. A whistle is a good piece of equipment to carry.

6. Plan a straight in approach with no **S-turns** to avoid canopy collisions on final approach.

7. When preparing to land look ahead to your landing spot. Judging depth perception at night is difficult. There is a tendency to flare high at night, so be patient.

8. Exercise caution when landing. If landing vertical, prepare for a PLF just in case. If landing high-speed, prepare to do a butt-slide landing (tandem-style). If you are unable to see the ground (e.g. if landing away from the lighted target area), then land with half-brakes and prepare to perform a PLF.

9. After completion of night jumps, everyone must personally check-in with the designated member of the ground crew to ensure that everyone is accounted for. This is also a good time to review procedures and find out how everyone did.

UNUSUAL SITUATIONS

SOLO JUMPERS:

1. Unable to read the altimeter: Activate the main parachute and spiral to below 2000' (best judgement) if there is another jumprun after yours.

2. Loss of dropzone visual reference/loss of orientation: Assess wind direction and attempt to locate DZ using landmarks such as street lamps or car headlights demarking roads. Know where alternate landing areas are during the daytime.

3. If landing away from the dropzone, prepare for a hard landing. The use of ½ brakes and the PLF position is recommended to avoid a higher-than-normal flare.

CAUTION: *With a bright moon behind you, it can appear as though another jumper is flying toward you. In fact, it is your shadow. Yell anyway in case it is another person landing at the same time. If it is your shadow, it will constantly appear to get closer, even if you turn away. Focus on your flight path directly ahead of you for landing and flare at the appropriate time.*

GROUP JUMPERS:

1. Loss of visual reference of other jumpers: 360° turn and try to locate other jumpers' lights; if no luck, track perpendicular to jump run until opening altitude.

2. Never open high as this could cause collisions with other jumpers in freefall exiting after you.

3. Maintain a good lookout for other jumpers under canopy, do not spiral, or perform violent turns. If a canopy collision occurs, assess the situation and react. Do not panic. With the higher performance square canopies on the market, the potential for canopy collisions has increased due to greater opening surge and faster airspeeds. The lower parachutist must

communicate with the higher parachutist; it is the higher parachutist that is in control and leads the situation. See §6.17.3 Canopy Collisions in **PIM 2A**.

7.3 EVALUATION

You may be tested on this material by way of an oral or written test. You do not have to perform a night jump to become endorsed. However, nothing can replace the experience of actually doing your first night jump. Each time you night jump, there will be a complete, specific briefing for that particular event, and it is your responsibility to make sure you are there to find out that important information.

RESOURCES:
CSPA—PIM 1—SECTIONS 3.2, 3.18 & 3.19, AVAILABLE AT:
CSPA.CA/EN/PIMS

SECTION 8 | Water Jump Endorsement

PREVIOUS: SECTION 7 | Recreational Canopy Control Skills
NEXT: SECTION 9 | Visiting Skydiver Checkout

Water jumps are preplanned parachute jumps into an open body of water more than 1.5m (5 ft.) in depth. A water jump can be an enjoyable experience provided normal procedures and a few additional precautions are employed. Physical injuries and drowning are almost unknown on preplanned and intentional water landings. The potential however always exists for an unintentional water landing due to spotting error, radical wind changes—or more probable—a round reserve ride near water.

Water may not be an obstacle at your home DZ. However, jumping at a new DZ can present water obstacles not previously encountered (i.e. a river instead of a lake). The technique for emergency water landings should be taught to all jumpers if open water exists close to the DZ. If not taught, the visiting jumper should ensure that adequate training in the form of the water jump endorsement be obtained.

There are three major areas that deserve attention for water jumps:

1. Planning the water jump;
2. Depth perception; and
3. Removing the equipment after entry into the water.

It is essential that persons jumping within 1 km of open water be trained and follow the procedures in accordance with the provisions of this section.

RESOURCES:
CSPA—WATER JUMP REQUIREMENTS, AVAILABLE AT:
CSPA.CA/EN/WATER-JUMP

CSPA—BASIC SAFETY RULE (BSR) #3, AVAILABLE AT:
CSPA.CA/EN/SAFETY/BSR

SECTION 9 | Visiting Skydiver Checkout

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PREVIOUS: SECTION 8 | Water Jump Endorsement
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9.1 YOU ARE THE VISITOR

As a visiting skydiver, the first impression that you leave is a reflection of yourself, your home DZ, your province, your country, and the CSPA. You are an ambassador of all these things whether you like it or not. How you appear, perform, talk, and present yourself is going to be construed as the typical behavior on your DZ. As these first impressions are important, you are recommended to follow these suggested guidelines.

- Have your CSPA affiliation card (showing CoP and Ratings information).
- Make sure your logbook is with you and up-to-date. This means all jumps signed, and all endorsements signed as required. Make sure your paperwork is impeccable.
- Make sure your gear is in good repair, and the reserve is in date and sealed by an authorised rigger. There is nothing worse than arriving at your destination only to have your gear grounded. It also does not put you in a favourable light.
- Be honest about your ability, do not brag about your home dropzone, and do not take it personally if they ask you to prove yourself. They do not know you. You should eagerly take the opportunity to show them your skills.
- If you are a student, make sure you have a current CSPA affiliation. You must be prepared to demonstrate what you know and possibly receive retraining at an added cost. Do not take this personally; you should be glad they care about your safe progression. (You should question the safety of a dropzone that does not give a student a briefing and checkout!) Be sure that your logbook is up to date. Be ready to provide details and phone numbers of your instructors back at your home DZ.
- Find out how the DZ works, its local rules, landing patterns and operating procedures and be prepared to follow them.

Be a good ambassador of your home DZ by cooperating with the person/persons checking you out. Your DZ would expect the same.

9.2 CHECKING OUT A VISITING SKYDIVER

The impression you give to the visiting parachutist is one that they will take back to their DZ, province, or country. It is very important that you present a good image.

CSPA policy requires Members to extend all privileges to visiting CSPA Registered Participants or FAI affiliated members. Documents and equipment must be presented to the member club/centre by the visiting jumper, when requested by the member club/centre officials.

Although CSPA and USPA standards are similar, the other FAI member countries have differences in equipment and performance standards and expectations. This point should be kept in mind when checking out visitors from other countries. If in doubt, contact CSPA's National Office. Here are a few guidelines to follow.

RESOURCES:

FAI WEBSITE, AVAILABLE AT:
FAI.ORG/PARACHUTING

FAI MEMBERS—ACTIVE BY COUNTRY, AVAILABLE AT:
FAI.ORG/MEMBERS

THE AERO CLUB OF CANADA, AVAILABLE AT:
AEROCLUBOFCANADA.CA/MEMBERASSOCIATIONS.HTML

▶ 9.2.1 VERIFICATION PROCEDURES

INTRODUCTION:

Introduce yourself and your position, (i.e. safety advisor, instructor etc.). Introduce the visitor to others. Make them feel welcome and at ease. Let them know that they are going to be checked out and be punctual about it.

Visitors will appreciate a thorough check out as it lets them know that they are getting involved with a safety-conscious skydiving centre. Any jumper should cooperate with you 100%, because they should realise your position and respect it.

CSPA AFFILIATION CARD OR FAI EQUIVALENT:

- Check the expiry date.
- Check for proof of third party liability insurance. If none is offered by a foreign organization, offer the CSPA affiliation as liability insurance. A parachutist who does not belong to CSPA or an FAI affiliate usually does not have liability or property damage insurance. In the case of an accident involving an (uninsured) Registered Participant, the member centre operating the DZ could be liable for all resultant damage/injury claims.
- Any signs of alteration would render the card invalid. Check with CSPA in cases of doubt.

LOG BOOK:

All skydivers are expected to maintain and carry with them a log of their jumps, appropriately signed by a certified skydiver. Ask for the visiting skydiver's personal log and examine it for completion and accuracy.

- Identity of the logbook holder relative to their other documents; i.e. CSPA affiliation card.
- Date and location of last **signed** jump.
- Type of jumps performed in the last six months.
- Endorsements and/or violations recorded in the logbook.
- If a student, refer the individual to a Coach or Instructor.
- Has the visitor jumped your type of aircraft?
- Do the signatures in the book generally seem to coincide with licenced jumpers known to be in their home area?
- Statements like "I don't log jumps anymore" or "I wasn't able to get these jumps signed because..." are unacceptable excuses, and should be treated with suspicion. Visiting skydivers should know and expect that a logbook will be required from everyone; saying their logs are on their electronic altimeter or in the home DZ manifest on the computer are not acceptable excuses.

LICENCE/CERTIFICATE OF PROFICIENCY:

- Check the class and number of the licence (certificate). If a non-CSPA licence/FAI equivalent, determine qualification requirements for class of licence held and the expiry date.

- Check date of issue, personal description, and signature of the holder.
- Any sign of alteration on **ANY** licence renders it invalid.

MEDICAL DISCLAIMER:

Member centres may require the visiting skydiver to complete and sign a medial disclaimer in lieu of a medical certificate. Should you have any questions about the disclaimer, please contact the member centre where you plan on visiting.

The use of a liability waiver is recommended and is common at most member centres. Should you have any questions about the waiver, please contact the member centre you plan on visiting.

WAIVER:

The use of a liability release is recommended and is common at most dropzones. Should you have any questions about the waiver, please contact the member centre you plan on visiting.

FALSE DOCUMENTS:

If a visiting skydiver is suspected of having false documents, follow these steps:

- Do not allow them to jump at your DZ until their status has been clarified.
- Contact the CSPA National Office and the visitor's home DZ for confirmation of their experience and qualifications.
- Advise the skydiver involved about the action being taken.

Should the investigation prove the validity of the documents in question, apologise for your mistake, and welcome them to your DZ. In the event the investigation bears out your suspicions, submit a full report of the incident to CSPA National Office with a request that other member dropzones, clubs, and centres be notified. Hold onto any "false" paperwork.

EQUIPMENT:

An inspection should be carried out by a rigger to determine the soundness of the equipment.

- Ensure that the individual is endorsed for the type of equipment being used.
- Harness and Container:
  - Webbing and stitching are in good condition
  - Hardware is serviceable
  - Canopy release and quick release mechanisms are functional and utilise

matching, compatible components
- Container assembly is sound, not damaged
- Container is compatible with the deployment device and activation system
- Any modifications, etc. are completed and documented

• Main (may not be able to check this until after first jump):
- Canopy and lines are in good condition
- Risers and links are in good condition
- Main closing loop is in good condition
- Deployment device and activation system are in good condition
- Canopy type is matched appropriately to weight and experience of jumper

• Reserve:
- Packed by a licenced parachute rigger and in date
- Check seal and pull force
- All modifications, etc. completed and documented

ORIENTATION PROCEDURES—SUGGESTIONS:

• Give them a guided tour of the DZ and the facilities.

• Explain any special DZ rules and procedures; i.e. pilot commands used, flotation gear, opening altitudes, landing patterns, obstacles, no-land areas (e.g. nasty farmers), etc.

• If the person is a student, refer them to the appropriate instructors.

• If the person is a novice, always check out their previous training and knowledge. If in doubt, put them back to the level of progression that their knowledge indicates.

• Ask questions about knowledge and ability; you do not know this person and you have to be sure they are safe.

• Stand by to evaluate them personally in freefall if you have to.

• Assess the individual through casual conversation and questioning.

• Their first jump at your DZ, depending on their experience, should be an assessment jump. They must demonstrate their ability.

• Show visitors the DZ, actually walking around, or by aerial photograph or diagram. Point out obstacles, prevailing winds, prominent landmarks, restricted landing areas, etc.

• Never loan or allow a visitor to jump equipment that they are not accustomed to using, as recorded in their logbook.

• Never allow an unknown, uncertified instructor to jumpmaster students.

• Never be impressed by jump totals, smooth talk, or attitudes.

- If in doubt as to the individual's ability or credentials, DO NOT allow them to jump at your DZ until you have checked with the CSPA National Office. Foreign jumpers must abide by and jump under CSPA regulations while using a CSPA member centre.
- Invite your visitor for after-jump social activities. It is important to socialize!

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