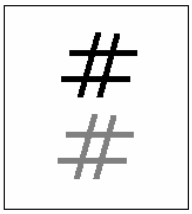
Parachute Downsizing Criterion



Middle of Range

(Smallest Allowed)

Jumpers with less than 500 skydives must not downsize beyond this chart.

***Jumpers are welcome to use a larger parachute than the chart suggests**.

Exit Weight (lbs) / Jumps	110 sf	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 (233)	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)
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)
499	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)

Jumpers are welcome to use a larger parachute than the chart suggests.
Size must be **Increased** as necessary to reflect "Relevant Variables"
(See Footnotes and Explanations)

**The chart is based on*
***"Total Exit Weight"**:*
[Jumper + All Equipment]

Footnotes and Explanations:

The chart gives two different values:

A) Top Number: "**Middle of Range"** (Square Feet)

*Not an absolute figure. See "Relevant Variables" (above)

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 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 increase 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 with regards to the "Essential Maneuvers" (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

-F.E.C. = More than 20% wing taper
-Fully Elliptical Canopies are not permitted 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 usually to err on the side of safety.

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 next the higher number.

Skipping Sizes and Planform 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 5 jumps on a smaller or more agile parachute should be made solo, opening no less than 5000 feet AGL.

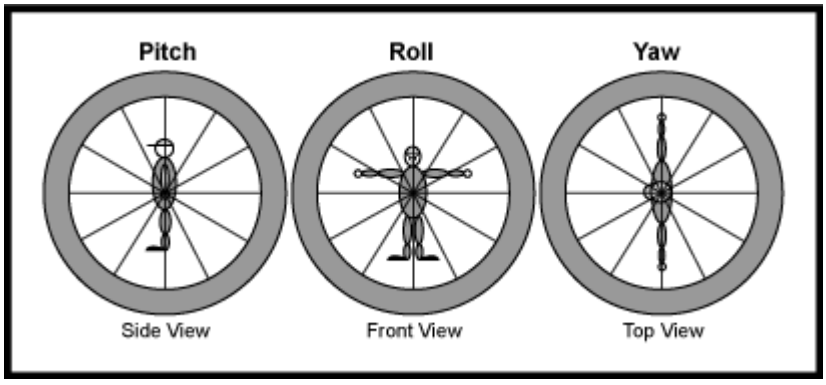
Frame of Reference

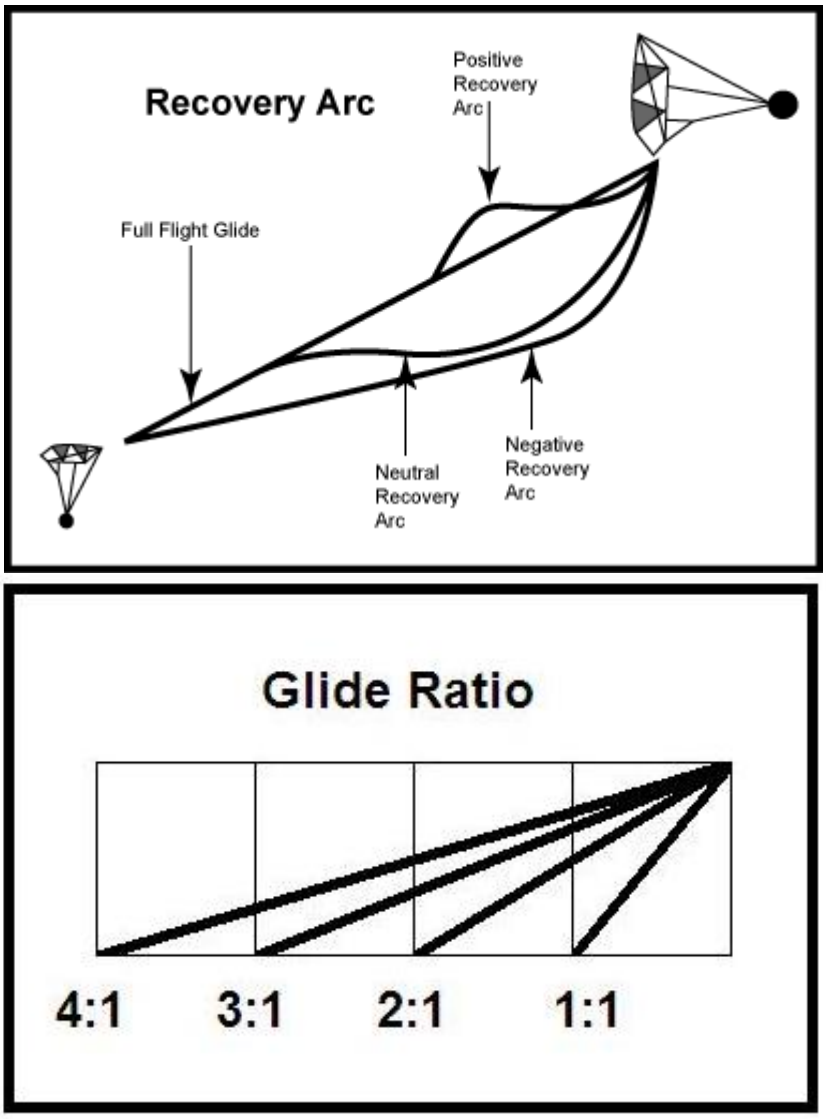
Depending on the jumpers previous experience, currency and individual ability, the canopy transition course instructor may chose to allow accelerated downsizing or skipping sizes.

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***.

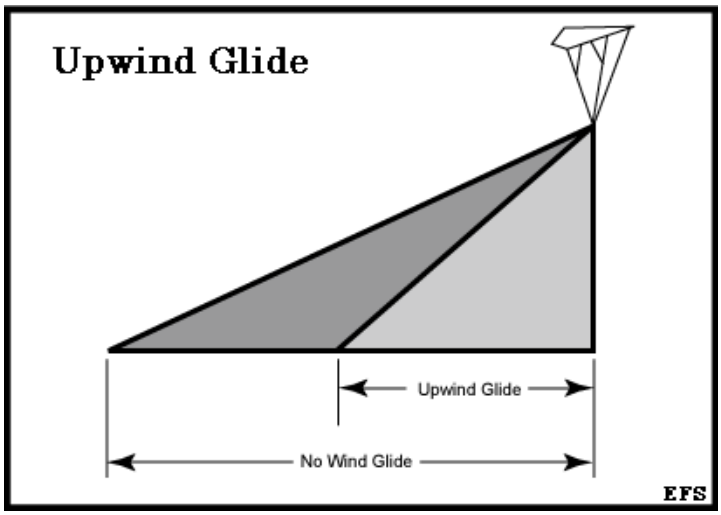


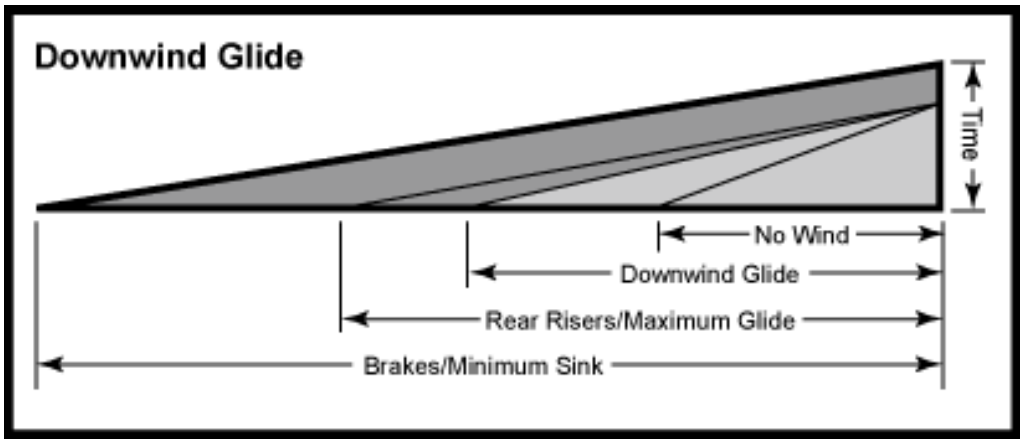


While a 170 square foot canopy may perform in a docile manner at 1.0 lbs per square foot, a 107 of the same design will be much more responsive at the same 1.0 wingloading. Therefore, the Chart skews the data in a non-linear nature, suggesting a more gradual downsizing progression for lighter pilots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





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 instability are a set-up for failure.

Essential Maneuvers

The following is a list of in-flight maneuvers essential to safe flight. These tasks must be preformed regularly, so that the pilot will have the ability to perform these maneuvers 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.**

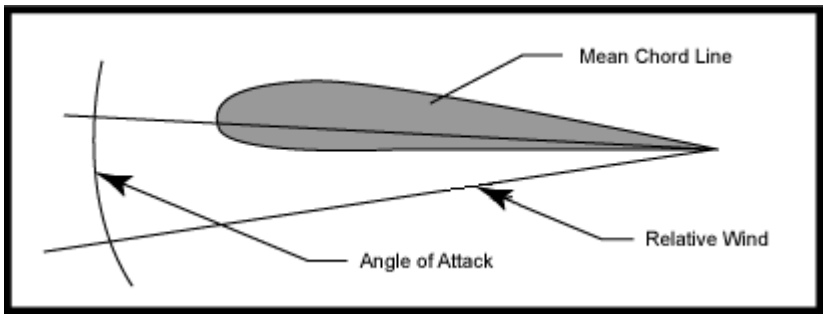
***All exercises should be performed on dedicated jumps, opening above 5000 feet AGL. Opening high following a relative work freefall may allow sufficient time to perform the maneuvers, but dedicated jumps are preferable as a learning experience.**

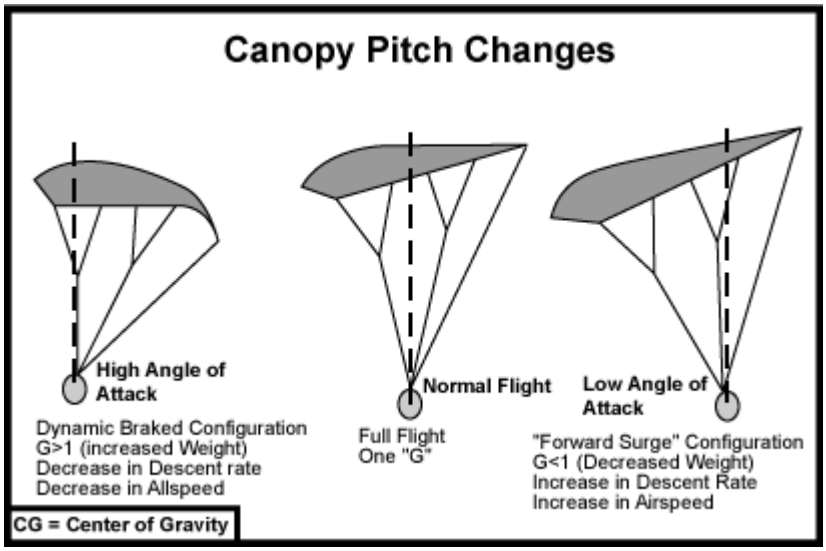
***Video should be used whenever possible for debriefing and evaluating landings and in-flight maneuvers.**

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 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 maneuver is therefore essential for safe landings.





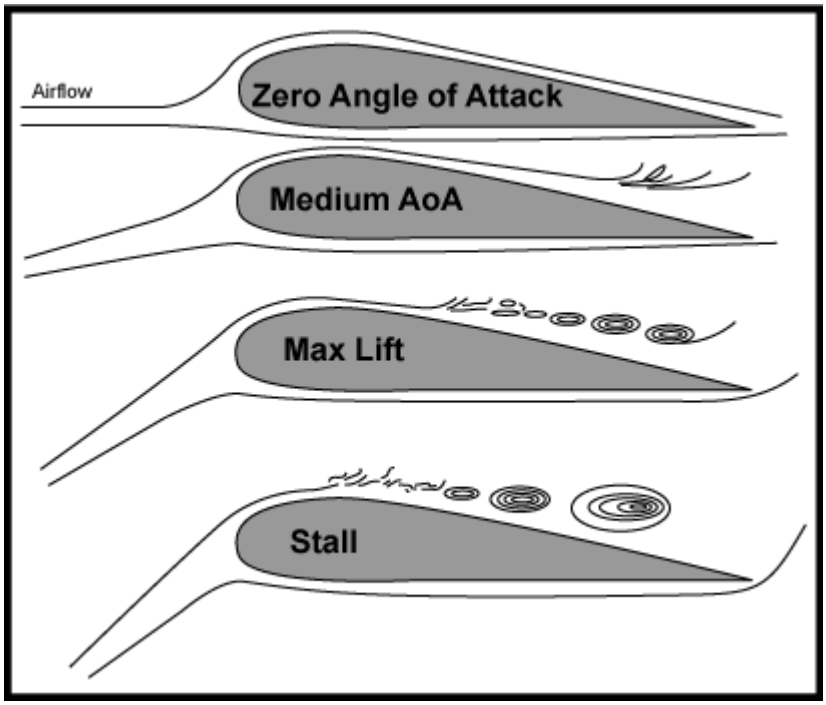
Stall Practice

- 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.

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.

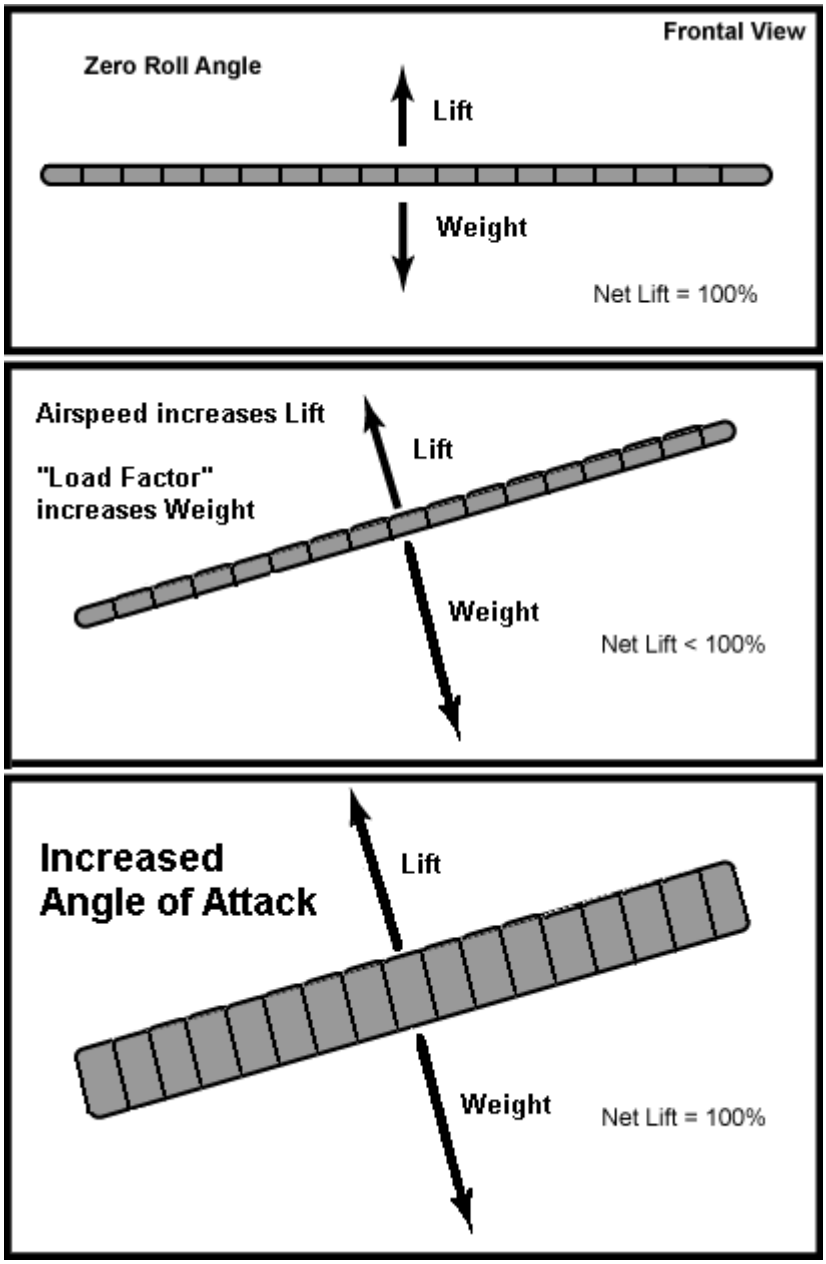
In order to land with great consistency, we must become intimately aware of the flight performance of our parachutes in very deep brakes. The more time we spend in this flight mode, the more comfortable we will be.

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 practiced 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 decent 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 maneuver 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 utilized 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.



Dive Arrest: Toggle Turns

- Begin maneuver 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 maneuver.

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 practicing 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 maneuver 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, this maneuver requires forethought and planning on exactly how to hold and release the risers without risk of inadvertently dropping a toggle. The 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 ¼ brakes is usually sufficient to diminish the resistance to within workable limits.

Why?

Reduction of the angle of attack is necessary for many flight maneuvers 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.

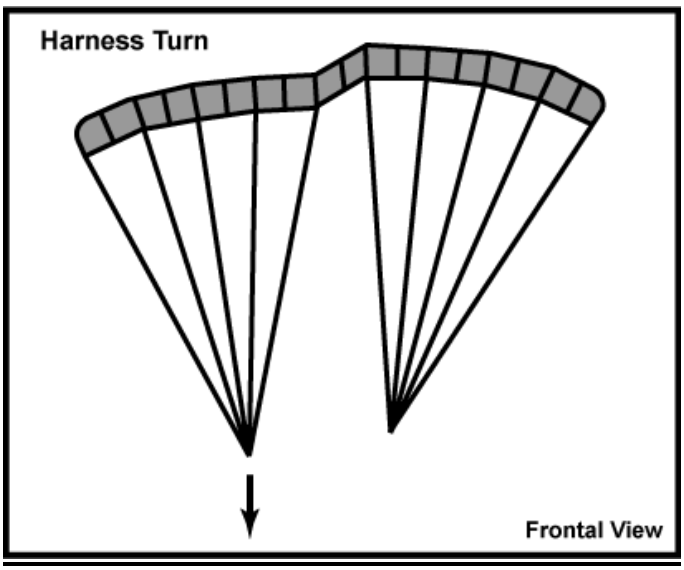
Why?

Immediately after opening, the harness can be utilized 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.

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 decent 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 of 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 maneuvering can be a superior control input to other options.



Precision Landing Pattern

- Enter the pattern with sufficient altitude for the decent 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 the 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.

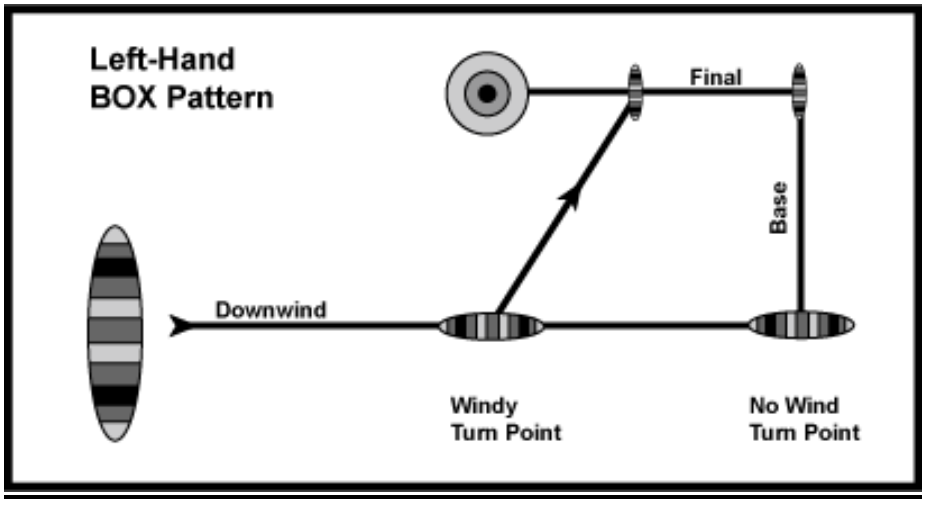
Deep brake approaches can deprive the system of the airspeed necessary for a safe landing, especially on heavily loaded canopies. Final approach, then, should be primarily flown in full glide with only subtle corrections.

*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 ensure 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.



Accuracy Landings

- 30 **Stand-Up Landings** within 10 meters of the target center, 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)

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 target of the approach 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:

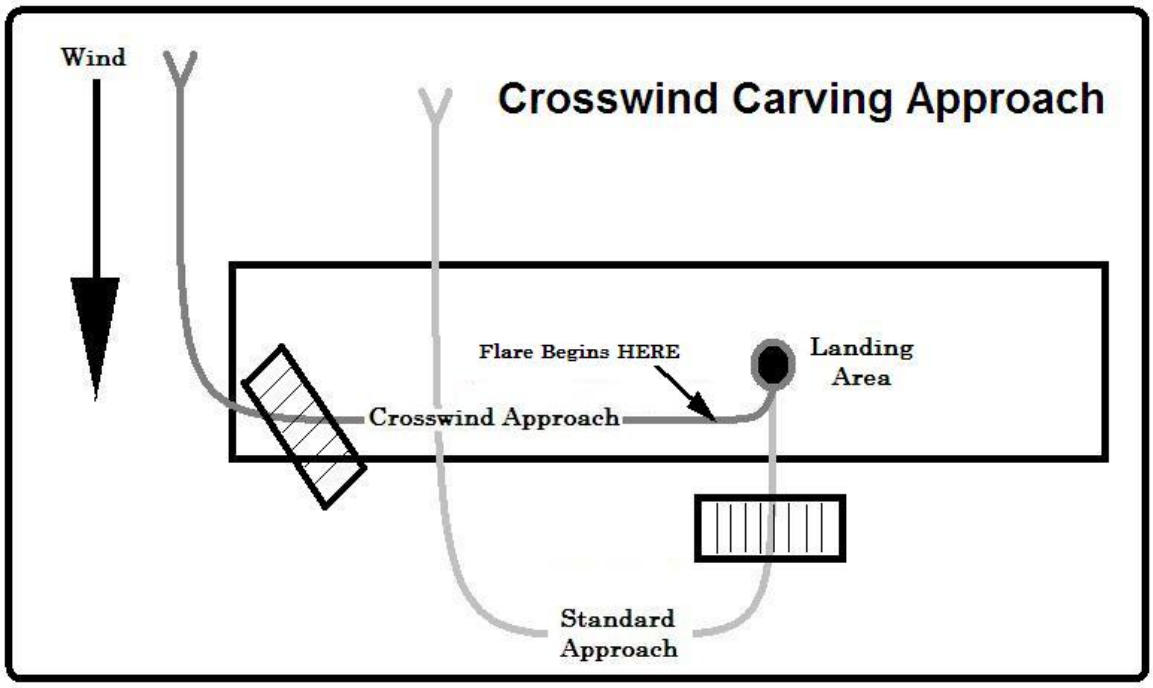
Airspeed is necessary for the performance of a level flight turn. It is not necessary, however, to accelerate the parachute beyond full flight glide in order to perform the maneuver.

It is essential that this maneuver 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's 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.



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

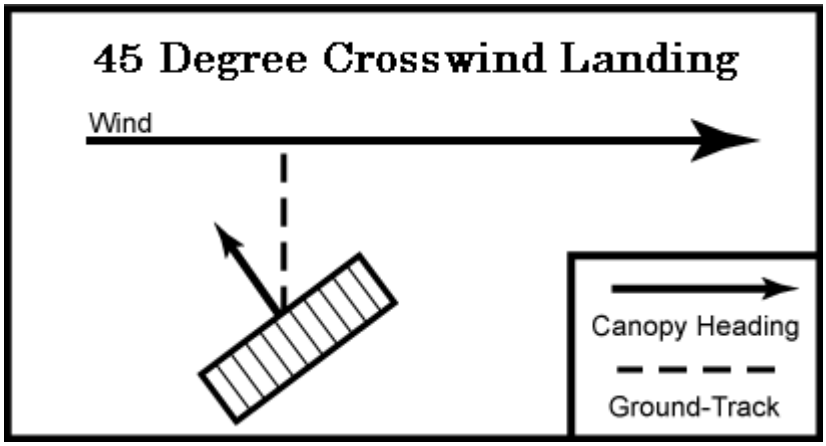
Attempting to run out a crosswind landing significantly increases the risk of injury. The jumper must place the heels on the ground first facing the direction of motion, and then gradually ease back onto the butt toward the completion of the landing. It is also important to continue the flare while sliding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

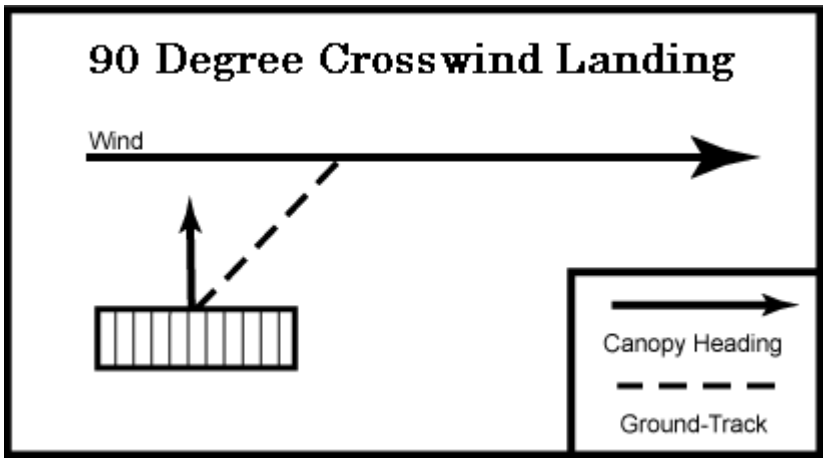
Do not attempt the crosswind landing exercise above 10 miles per hour ground wind velocity. In the event that the jumper is forced to perform a crosswind landing in high winds, it is advisable to carve the canopy into the wind during the landing flare as much as possible, without touching down with significant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

Crosswind landings must always be performed away from the normal landing area so as to avoid creating a traffic hazard. Further, the site chosen for this maneuver 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.

***Do not attempt to land more than 90 degree off the windline while practicing 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 practiced 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 is a very useful asset for this, but ultimately it is our eyes that tell us how high we are.
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:

1) In the event of mismatched airspeed and descent rate due to disparate wingloading, have the slower canopy open 300-500 feet lower.
2) When the other canopy is stuck behind you, turn your parachute 90 degrees to reduce the closing distance.
3) When in close proximity, make all your course corrections slowly and predictably.
4) 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) **Synchronized turns of 45 degrees or less.**
    - Maintain proximity
    - Maintain relative altitude
    - Use any and all control inputs to maintain proximity.

3) **Synchronized 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 practice “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 maneuver. It is therefore a part of the learning process to cultivate the skill of steep, high speed approaches.