

Australian Parachute Federation



FREEFLY AND ANGLES GUIDE



August 2023

Status: Educational

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Warning

Parachuting and flying in parachuting aircraft can be dangerous.

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This guide is not a do-it-yourself guide to skydiving but should only be used while under the supervision of a qualified APF Instructor or Freefly Coach. Individual skydivers should check the information in this guide and assess the risks involved before carrying out any of the procedures or manoeuvres described.

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Credits

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PART 1 - INTRODUCTION

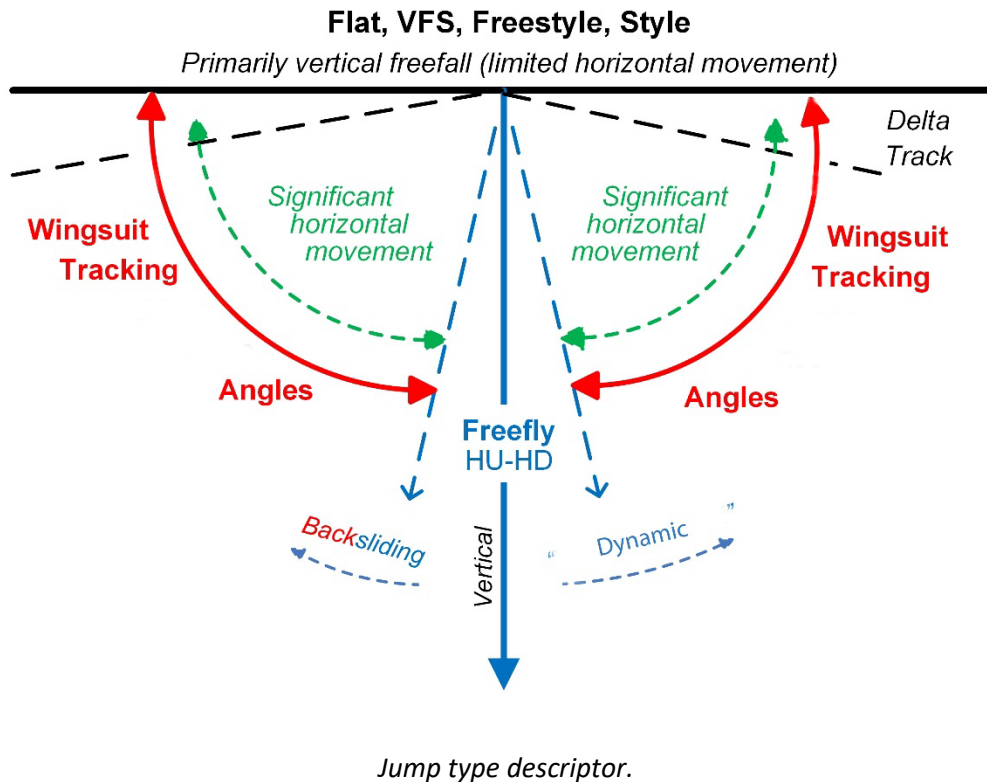
Freefly encompasses flying in all orientations; Head-up, Head-down, Tracking, back flying, belly flying and diagonal trajectories. Advancement in this multi-faceted discipline will be much faster if the novice has a sound understanding of the body's aerodynamics in flight.

Under APF Rules and Regulations, jumpers require a Certificate Class B before starting freefly training. This means they have already demonstrated competence in the "belly to earth" orientation as well as showing capable tracking and deployment skills. These are the *basic survival skills*. To be able to complete any jump, Freefly or belly, in a stable orientation for safe deployment, is not optional, it is *must know* skills.

This guide is intended to give the reader an introduction and some assistance towards developing freefly and movement/angles jump skills. It is not a do-it-yourself guide, but rather something to help along your freefly development.

Covered in this guide will be; progression, the equipment requirements of freefly, basic safety rules for all freefly/movement jumps and discipline specific notes and advice.

HORIZONTAL, VERTICAL, IN-BETWEEN: DEFINITIONS

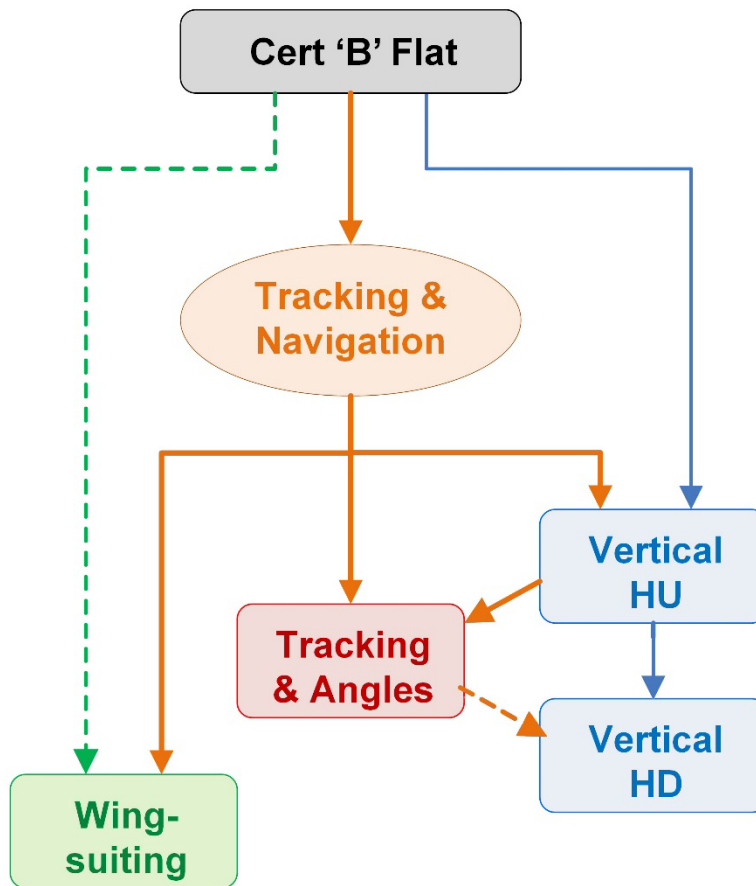


PART 2 - PROGRESSION

It is possible to learn to freefly on your own, but the fastest, safest and absolutely the cheapest in the long-term, is to jump with an experienced, qualified instructor/coach. Students can alternate solo jumps with coach jumps, thus consolidating what has been learnt before moving on to the next step.

There are generally two paths leading to freefly mastery. Some are inclined towards learning tracking and developing this into flying angles or the more traditional path of head-up followed by head-down and using this to transition into tracking and angles. Both paths work well and have positive and negatives. Which path a jumper chooses will largely depend on where their specific interest lies and where they wish to progress to.

HORIZONTAL, VERTICAL, IN-BETWEEN: SKILLS PROGRESSION



Progression pathways.

PART 3 - FREEFLY BASICS

Before a flyer begins a new type of jump, they must ensure that they have had a full safety briefing from a qualified individual at the dropzone they intend to jump at.

Any jumps made with a Freefly Coach are *training jumps* and will therefore require the direct supervision of at least an Instructor with a DZSO endorsement.

Before attaining a Freefly Crest, jumpers are too limited to jumps no larger than a 3-way. Once they have attained a Freefly Crest, they may participate in jumps up to a 10-way if they do not have a Starcrest and jumps as approved by the DZSO if they do have a Starcrest.

3.1 Equipment

Container

Freefly and Angles make high demands on equipment. All gear must be in excellent condition. Equipment must be able to tolerate the higher speeds and unusual angles of relative wind.

- No student equipment.
- No rigs with twin, rear pin reserves.
- Hand-deploy BOC (bottom of container) or pull-out system is mandatory. No leg strap throwaways.
- Excellent condition of the spandex BOC pocket, to avoid a premature opening. Make sure the pilot-chute is a good fit.
- All parts of bridle should be covered or tucked away with no chance of being prematurely exposed.
- Tight riser covers (tuck-in flaps strongly recommended. Velcro should be in a brand-new condition, if not it will most likely be deemed non-freefly friendly).
- Secure main and reserve flaps.
- Cutaway and reserve handle secure.
- Closing loops (main and reserve), sufficiently tight and in a good condition
- Automatic activation device (AAD) is highly recommended (mechanical devices, such as an FXC 12000, are unsuitable).
- Elastic bungee in between leg-straps is recommended to prevent leg straps from sliding/slipping up towards the knees while in a sit position.
- Main and reserve parachute sizes should be compatible with the container design to ensure a correct fit, proper tension on the closing loops and BOC pouch (canopies should neither be too small nor too big for the container).

Goggles, Altimeter & Helmet

- Goggles tight and secure.
- A visual altimeter is mandatory.
- One audible altimeter is mandatory, a second is recommended.
- A hard helmet is mandatory up to Certificate Class C, and highly recommended for everyone else (especially beginner freeflyers regardless of other experience). A helmet is also very important so that any audible altimeter can be heard.
- A single point release system is recommended for camera helmets, with the strap secured.
- Do not jump with a helmet equipped with a camera bracket WITHOUT the camera, as the bracket is a sharp dangerous object and possibly a safety hazard.

Clothing

- Purpose designed clothing or jumpsuits are ideal.
- Avoid clothing that may open in freefall, i.e., a secure zipper system on jumpsuit.
- Avoid clothing that may cover your handles by coming loose at the waist.
- Avoid clothing that can stretch too much (e.g., long-sleeved sweat shirt)

Harness fitting

- Chest straps need to be much tighter for freefly jumps than flatfly. Ensure that the loose end of the strap is tightly secured.
- The parachute harness should be tight enough to avoid it moving during freefall. (It is especially important that the yoke does not slip off a shoulder.)

3.2 Planning and Exit Order

- The recommended minimum altitude for a freefly jump is 10,000ft.
- The exit order should be organised by the loadmaster to consider all necessary factors, which can include; weather conditions, group types and sizes, jump run groundspeed, weight and balance of the aircraft. The DZ will likely have an exit order policy, if you don't know what it is, ask!
- Flatflyers, due to a longer freefall, will most often have more drift than freeflyers. It is therefore recommended if jump run is into wind, or where the wind is negligible, freeflyers should exit after flatflyers.
- Tracking groups can have the same amount of drift as flatflyers so it is recommended that this be considered when organising exits.
- It pays to be aware of any crosswinds a group may encounter in freefall. If possible, track into crosswinds, this will reduce groundspeeds during freefall which will decrease the likelihood of an off landing.

- Note: in high upper headwinds the amount of separation depends on the amount of ground covered by the aircraft; it is never an arbitrary 8 or 10 seconds! If you don't know how to calculate the required exit separation, ask!

3.3 The Jump

Freefall

- Freeflying involves much higher vertical speeds than flatflying. This higher vertical speed can translate into faster and further horizontal movement. Understanding this is essential to avoid freefall collisions.
- Always remain aware of altitude. Freeflying can generate much higher freefall speeds and freefall times can be significantly shorter.
- Whether tracking alone or in a group, always work 90° from jump run.
- Always maintain awareness as to where other members of your group are; especially at break off.
- Avoid radical level changes - for example, transitioning to belly, during vertical jumps – and learn the Recovery Position to better maintain vertical speed before jumping with other freeflyers.
- During long tracking jumps; ensure proper heading awareness and control! Always be flying away from jump run and not turning back towards it.

Height Awareness

- Be aware that different attitudes during a jump can affect how altimeters read. In a back to earth position, a chest altimeter will likely read slightly low.
- Altimeter needles can stick, digital altimeters can malfunction and audible batteries can go flat. A visual reference with the ground, is a good back-up.

Break Off and Opening

- Minimum break off altitude for a two-way is 4,500ft.
- Minimum break off altitude for a three-way or larger is 5,000ft.
- Visual awareness is critical before break off. Make sure everyone knows where everyone else is!
- Freeflyers should go into a progressive track to ensure safe break-off. For an explanation of “a progressive track” see section “Learning Tracking”.
- If possible, always track 90° to the jump run. If there are no other options other than tracking along jump run, don't track as far. This can be a factor when jumping in large groups, which is why there must be sufficient separation.
- Always visually check for clear airspace before opening.
- Perform a barrel roll to check there is no one above prior to opening – only perform this if capable of doing a smooth and reliable barrel roll; at deployment altitude is not the time to go unstable!

- If directly above someone at break-off height and it is safe to deploy – PULL! DO NOT TRY TO OUT TRACK THEM!
- After opening, turn 90° to jump run. Then ensure the next group are open and in control of their canopies before flying along jump run.

3.4 Skyballs

The following has been adopted by the APF Board...

Skyballs only to be used by freefly endorsed instructors with strict restrictions on spotting conditions. Any person qualified to use a skyball should also be made aware of the legal implications of using the skyball (similar to the skysurf board issues).

PART 4 - CORKING

The term 'corking' is used to describe a sudden decrease in velocity by a jumper relative to others. The phrase originates with the idea of a cork being held underwater shooting to the surface when released.

Corking can happen on vertical jumps when a flyer loses their head down or head up body position and suddenly reverts to a belly to earth position. They decelerate rapidly and should contact be made with another jumper, it can be rendered catastrophic by the speed differential.

Corking can just as easily happen on a movement jump. If a jumper is unable to hold their body position and become unstable, or suddenly revert to a flat and stable position, the rapid deceleration will put them in the way of any jumpers following behind. Again, any contact between jumpers can be catastrophic.

Generally, skydivers are more prone to corking while learning to freefly. During a period of confusion or frustration they are more likely to revert to an arch and belly to earth position out of pure habit or instinct.

4.1 Recovery

New freeflyers and movement jumpers must learn to make themselves "cork proof". Rather than reverting to the stable belly to earth arch, which has been learnt and reinforced from the first jump course, jumpers new to freeflying and movement jumps need to learn to adopt the recovery position for the discipline as a matter of reflex.

Learning early on how to adopt positions which are stable and maintain speed, will ensure flyers don't become a danger to themselves or others.

4.2 Vertical Recovery Position

The Vertical recovery position resembles a modified Sit-fly, but with a back-to-earth orientation, (this position is a modified Sit-fly and is a good reason to start Freefly progression with Head-up).

Here are some tips to help learn this position:

1. Lay in a back to earth orientation.
2. Feet close together
3. Knees up toward chest
4. Arms out to the sides and back a little.

NB: The position tends to fall more back-to-earth depending on arm position.



Vertical recovery position

The vertical recovery position provides a head-up orientation and will assist with faster recovery and regaining situational awareness quicker. From this position, it is a straight forward manoeuvre into a sitfly/stand-up position or transition into head-down without corking.

4.3 Recovery Position Tracking/Angles

Should a jumper lose their body position during an angle or tracking jump, it is important to maintain a heading with the group as best as possible and to try to maintain speed.

Should a flyer encounter issues, it is important they attempt:

1. Orientate in the direction of track as quick as possible.
2. Add speed in the direction the group is traveling.
3. Do not extend limbs to catch wind and gain control. This will increase drag substantially and slow the jumper down, aggravating the corking process.
4. Return body to correct angle of attack.
5. If the above do not help and the jumper is still unstable, they should attempt to move away from other jumpers as safely as possible with minimal speed differentials and re-start their approach into the formation.
6. **Do not track away!** Keep eyes on the group and follow until break off. Separated jumpers may need to deploy higher than initially intended to avoid interfering with planned break offs. Be sure to check airspace above for other possible flyers before deploying.

It is recommended that jumpers become proficient at tracking before attempting angles. This proficiency will allow the development of good recovery procedures in the safer environment of tracking, before attempting angles.

PART 5 - TRACKING AND ANGLES

5.1 Learning to Track

At this point, jumpers need to have attained some level of tracking proficiency. It is a basic survival skill that starts in AFF, then is developed in B-rels. No one can ever be “too good” at tracking! It is a necessary skill for all jumpers and, conveniently, it’s also lots of fun in its own right.

5.2 Belly and Back Tracking

Before attempting any tracking jump, ask a local instructor about the current upper wind conditions, intended jump run and composition of the intended load before deciding which direction to track in.

If there are other movement groups on the same load, be certain everyone is aware which direction each group is headed. Generally, this will be in opposite directions to one another.

Whether tracking alone or in a group, always work 90° from jump run.

After a jumper has developed a proficiency in belly tracking, they may then progress to back tracking.

It's important to maintain an awareness about distance covered during the jump! Consider opening higher if required.

5.3 Angle Flying

Angle flying is a more advanced version of tracking. The position is similar for both, but the angle of attack is steeper for an angle dive, ranging from 25° to completely vertical. Angle jump speeds can range from 270 kph to 400 kph or more. An angle can also incorporate fast banking turns, various combinations of pitches during a single jump and can have significant speed changes and differences.

5.4 Position and Technique

Belly

Hold the general body position required to stand on the ground looking forwards. Flyers must make sure their lower legs are exposed to the relative wind while on their belly. Arms are to the side of the body and slightly back. Being flatter in the air is the key to horizontal movement.



Belly position 1.



Belly position 2.

Back

Hold the general body position required to stand on the ground looking forwards. Don't hook feet or calves behind; maintain a straight body. Arms should be to the side of the body and slightly in front. Head is back, looking in the direction of travel



Back position.

5.5 Exit

Always exit head first into the relative wind for both angle and head down jumps. Once off the hill, adopt the position required for the jump. Exiting head first into the relative wind allows a clean start and ensures airflow over the body immediately.

A head high exit will most likely result in creating a lot of drag in both belly and back orientations and the inefficient aerodynamics will immediately cause the jumper to lose proximity with the group. A head low exit will result in a steeper pitch, most likely causing the jumper to tumble or drop away from the group.



5.6 Adjusting Speed

Increasing speed

For both belly and back flying:

- Hold arm position for stability and bring legs together.
- To further increase speed, bring arms closer into torso.
- Raising or lowering the head will change the angle rapidly and can cause the flyer to cork.
- This position will create a smaller balance point which can easily cause instability.



Decreasing speed

For both belly and back flying:

- Widening the stance will help to create stability.
- Widening arms will then add drag and slow the jumper down.
- Bend at the knees, ensuring to keep the shins exposed to the relative wind.
- Keep symmetrical and ensure movements are smooth, to maintain stability.



5.7 Corking

Sudden corking during a track can have dire consequences, as discussed earlier in this manual. Corking in a track can result in hitting jumpers behind, rather than above, which may occur on a vertical jump.

If a jumper does cork during an angle or tracking jump, it is important they try to maintain speed in the direction of travel to minimise any speed differential. Further principles can be found in the earlier section on recovery positions. If a collision is imminent, it is important not to stick arms or legs out as they will likely create a sharp point of impact and can cause injury to both jumpers.

5.8 Turns

Turns are generated from the centre of gravity: the jumper's core.

- Look over the shoulder in the intended direction of the turn.
- Turn the torso by turning the hips and shoulders and the deflecting air will now push the jumper in the desired direction – much like an aircraft banking.
- Adding further input from the same side will increase the turn e.g. shoulder or calf.

5.9 Adjusting Height

Increasing height

Ensure at all time visual contact is kept with the formation.

- Increase speed then adopt a flatter angle. Without an increase in speed, any decrease in angle will only cause the flyer to flatten out, subsequently losing proximity with the formation.
- Once the intended height has been gained, return to the neutral position and angle of flight.

Decreasing height

Ensure at all time visual contact is kept with the formation.

- Slightly de-arch the body, bend the legs to maintain exposure of the shins to the relative wind and pull the arms back and behind the body.
- This will cause the body to sink away and descend from the formation.

5.10 Break off

When breaking off from the formation it is important to continue straight and peel off from the formation slowly. The flyers on the outer part of the formation are to turn the furthest and the flyers in the centre are to turn the least. The leader is to continue straight. ***It is extremely important not to turn in place as this can result in a flyer impacting you from behind as they may still be following the group.*** Keep forward speed and slowly peel out. This will also allow you to gain maximum speed and distance from the group.



5.11 Transitions

Belly to back

Maintain visual contact with the base of the formation at all times.

- Gain height very slightly.
- Drive the shoulder which is closest to the formation up and over the body.
- When coming out of the transition, match the angle of the group and increase speed slightly.

Back to belly

Maintain visual contact with the base of the formation at all times.

- Gain height very slightly.
- Drive the shoulder which is furthest from the formation up and over towards the formation.
- When coming out of the transition, adopt the belly Atmonauti position and the correct angle of flight.
- Keep downward pressure on the air with arms.
- This transition is intended to be performed quickly, as this will prevent the flyer from sinking below and slowing behind the formation.

5.12 Cautionary Notes

Angles can be dangerous because of the varying pitch, speeds and turns. There is a high risk of corking on an angle jump and the consequences of corking on these jumps can be severe.

Angle skills are advanced and extremely fast; however, they will enhance a jumper's navigation abilities and will assist spatial awareness skills. These skills will help build competency for future high-speed disciplines and will teach jumpers to fly their bodies instinctively.

Considerations:

- The lead flyer must always fly belly to earth. This is to ensure the correct angle of flight and so the group are led in precisely the right direction.
- Speed = lift. The faster a flyer moves horizontally, the slower their vertical descent. Stalling out by being too flat in flight will cause the flyer to fall behind the formation and make it difficult to get back into the formation.
- Do not drop a shoulder under the body whilst transitioning. Always transition over the body. Dropping a shoulder will cause the flyer to sink out.
- When approaching the formation, the flyer must always approach from the rear. Failure to do this will likely burble the flyers. This, as well as the flyer coming from an unexpected direction, can lead to collisions and is an unsafe practice.
- Watching or filming other jumpers can disrupt an ideal body position, resulting in poor tracking performance.

5.13 Tracking or Angle Flying in Groups

When flying in groups, jumpers need to be very mindful of the path they take to approach the formation. ***Do not aim at the formation, aim in front of the formation.***

Safe Flying zones are above and ahead of the formation for belly flyers and below and slightly behind the formation for back flyers. The horizon is a useful tool in establishing where above and below the formation is as the relative angle of the leader and other flyer's bodies can change.

Jumpers must also be aware of the No-Fly Zones around a formation. No-Fly Zones are where approaching flyers start to encounter other flyer's burbles. In addition to the risk of becoming unstable in another jumper's burble (thus creating the risk of corking and/or a collision), the approaching jumper is placing themselves at risk of being hit by a jumper in front corking.



With the leader as the dividing line; there are 2 belly flyers and 3 back flyers in safe flying zones. A total of 4 flyers are in the No-Fly Zone on the top right.



When approaching a formation whilst back flying, approach from behind and underneath. Red circled flyer is too far forward and entering the "No fly zone". Green flyer is on the correct line of approach.



When approaching a formation, aim in front of (not at) the formation. This will minimise the danger of the approaching flyer corking into another jumper and also being hit by a flyer in front who has themselves corked.

These danger zones are specific to tracking and angle flying, this is different for vertical free flying where vertical flyers will cork up along a burble and not backwards.

5.14 Leading a Tracking Dive

When leading a tracking dive, it is important to have a complete understanding of jump run, expected ground speed, upper winds and the composition of the rest of the load. All these factors will have an impact on the direction of flight.

Build a mental picture of the DZ

Build and memorise a picture of the dropzone and its environs. As the closer aspects of the Dropzone become more familiar, expand the mental picture and fill it in with more detail to enable more ready identification of landmarks during a jump. Build on this picture every ride to height. Delight in being able to orientate to the dropzone with only the most obscure landmarks. This detail and understanding of the terrain and features will greatly improve a group's ability to navigate safely and return to the dropzone as a group.

Make sure all jumpers in the group are able to discern the correct jump heading. Discussions of which bearing jump run is on lack relevance if jumpers are unable to identify all points of the compass on the ground and in the air.

Mid-jump checks

Develop a system of questions to cycle through during a jump.

1. "How is my heading?" Using landmarks, check to see if the jump's current heading is what was planned and discussed. If it's not, fix it.
2. "How is the group?" Are individual jumpers struggling to keep up? Is everyone sinking out or verging on overtaking the leader? If required, adjust the forward speed or the fall rate.
3. "How am I?" How does your body feel? Are you actually on the angle of attack that you think you are? Check the horizon and see if you are flatter or steeper than you think. Adjust accordingly.
4. Repeat.

Cautionary Notes

- When tracking in conditions with strong upper winds, or high levels of wind shear, be sure to fly into wind. Tracking into the wind will help reduce the group's ground speed and put them upwind for opening, which will increase their odds of returning to the DZ under canopy.
- Be extra mindful of exit separation and directions of any other movement groups on days with strong or diverse winds in freefall.
- Tracking groups can go anywhere in the exit order. However, it is recommended that they go first or last.
- Once under canopy, make sure airspace is clear before heading back to the dropzone. Identify who the other groups are, what the likely speed and descent rate of their canopies might be and where they will be landing. Mitigate traffic issues before they become an issue.

PART 6 - VERTICAL FREEFLY; HEAD UP

6.1 Description

Head-up is generally the first step in vertical aspect of freeflying. Head-up is very often thought of as sit flying, but ultimately accounts for vertical body positions from sit to stand and all the variations in-between. Speeds will vary from 220kph to 260kph and beyond.

6.2 Position/Technique

For the simple sit-fly position, the flyer should set their body as if sitting upright on a chair.

- Feet should be flat as if on the ground and with an even pressure.
- Knees should be bent at 90° and shoulder width apart.
- Hips 90° with the torso perpendicular.
- Arms 90° out to the side to create stability.
- Head should be relaxed with eyes to the horizon.
- Over time, this position tends to evolve to bring arms closer to the body, with most flying control done with the legs.



6.3 Exit

There are several methods to exit head-up. The easiest to method start with is back towards the relative wind. With practice, progression and guidance, jumpers will quickly be able to maintain stability in this position on most exits and be able to fly the hill to a vertical stance.



The first 3 jumpers have all exited correctly, with feet into relative wind. Flyer on the top left exits in recovery position, back to relative wind. All other jumpers are off axis and will lose proximity with the group.

6.4 Adjusting Vertical Speed

Increasing Speed

To increase vertical speed in head-up, flyers may adopt either a stand position with either one or both legs down.

From basic sit position:

- push one foot down until the leg is straight, keeping even pressure on both feet;
- to keep stability and generate more speed, arms can be lifted above the head.

Straightening both legs will further increase speed. It is important to keep pressure even between the feet, as the smaller surface area in contact with the relative wind has decreased inherent stability and the higher speed can result in corking.

Decreasing Speed

To reduce the descent rate from the basic sit-fly position, a jumper needs to create more surface area.

- keep arms out 90° to the side;
- lean back on to the wind;
- Extend the feet out to the side past the knees, using the inside of the lower legs to catch air;
- keep knees shoulder width apart and ensure feet are pointed forwards.

6.5 Horizontal Movement

Forward Movement

Is generated in head up by:

- pushing the legs into a stand-up position;
- driving the hips forward and leaning back into the wind;
- think of pulling the shoulder blades together keeping the arms out to the sides for stability.

Backward Movement

Is generated in head up by:

- pushing the legs into a stand-up position;
- leaning forward slightly and pulling the hips back;
- too much input can easily cause flyers to cork so keep movements controlled and gradual.



6.6 Turns

Turns are generated by moving one foot out, the same as for a slow fall. The air will deflect off the surface area of the calf and turn the flyer in that direction.

6.7 Transitions

Cartwheel

- Initiated by bringing one foot up to the opposite knee, this will start the rotation.
- To continue full rotation, tuck up into a ball (arms in and knees to chest).
- As the flyer returns to head-up, adopt the sit position and force legs down to gain stability.

Back Flip

- Initiated by allowing the air to catch the surface area on the back of the calves.
- Arms push down on the air.
- To continue the rotation, tuck into a ball.
- As the flyer returns to head-up, adopt the sit position and force legs down to gain stability.

Front Flip

- Initiated by tucking legs under your torso, catching air on the shins.
- To continue the rotation, tuck into a ball.
- As the flyer returns to head-up, adopt the sit position and force legs down to gain stability.

6.8 Cautionary Notes:

- It is important to keep pressure even: pushing down with both feet and not using arms to maintain stability.
- Should a flyer allow the wind to push knees towards their chest, the inevitable result is backsliding.
- Another common error: the torso leaning too far forwards, with the arms out behind the torso. This will also cause backsliding and make it hard to take docks.
- Looking down changes body position and can cause backsliding.
- A solid base is needed and should stay on heading and maintain a steady fall rate.
- Orbiting occurs when the flyer initiates a turn and drives forward at the same time. The jump becomes problematic for all concerned if the base is orbiting.

6.9 Head-up Exercises

Turns, head-up to head-up transition with a front/back loop and side transition.

For these exercises, emphasise the quality of the execution of each individual part of the movement.

- Forward and backward movement is achieved in head-up flight by pulling the head back to go forward and slightly leaning forward to go back. Do not move the hips as this is the basis for the flying position.

- Any lean, forwards or backwards, will result in an overall increase in the flyer's surface area. Standing, even if just slightly, while moving forwards or backwards can compensate for this increase in surface area and will enable the flyer to maintain an even fall rate. Be aware though, in a stand, the flyer's aerodynamic properties have also increased, and inputs will produce reactions more quickly.
- It is important to maintain levels while moving forwards and backwards.

A few jumps with an instructor/tutor will prevent the acquisition of bad habits and will help achieve a correct basic position quickly.

6.10 Common Problems

Common problems when learning to fly head-up?

- Height awareness
- Shoulders and arms quickly becoming tired or rolling forward, losing lift or causing a backslide.
- Feet and knees too close together and tucked under the flyer.

Falling out of the head-up position into a back to earth orientation?

Possible causes:

- Trying to fly with the feet and toes pointed toward the ground instead of having them flat.
- Allowing the lower legs to get blown around by not being aware of holding them down in the correct position. Should have no direct air hitting front or sides of the lower legs.
- Arms too far forward
- Back not straight, with either the shoulders rounded, or the lower back arched.

Fall out of the head-up position into a belly earth orientation?

Possible causes:

- Knees bent less than 90°, the heels tucked under the flyer's body with wind on their shins.
- Back not straight; arching too much

Uncontrolled rotation?

Possible Causes:

- Lower legs not symmetrical, one leg out more than the other.
- Arms not symmetrical. One arm higher than the other.
- Legs too close together.

PART 7 - VERTICAL FREEFLY; HEAD DOWN

7.1 Description

Head-down is an inverted vertical position and has three standard neutral positions: Daffy, Straddle and Shelf. In the Daffy position, one leg is in front and one leg behind. Straddle has legs out to the side. Shelf has both legs out behind the flyer. The torso is straight and strong. Arms are strong, slightly out to the side and front. Speeds can vary from 270kph to 400kph or more.

7.2 Position/Technique

Below are the positions and techniques. Each of the positions require slightly different inputs for movement.

7.3 Exits

For beginner head-down flyers, exits should be similar to tracking/angle exits in that the head and shoulders are presented to the relative wind. Adopt the intended head-down position (daffy, straddle or shelf) and focus on the horizon to find the vertical position. The body follows the head so ensuring the horizon is horizontal to your line of sight will effectively put you in a vertical position.

7.4 Straddle

Position

- Arms are positioned 45° in front of the torso and slightly wider than shoulder width.
- The head and torso define the angle of flight, in this case vertical, it should be the same as standing naturally on the ground.
- During early stages of learning head down, the legs should be wide apart and slightly bent at the knees using calves and outer thighs as surface area for drag and control



7.4.1 Adjusting Vertical Speed

Increasing Speed

- Hold the arm position for stability.
- Slowly bring legs together keeping legs slightly bent at the knees.
- Straightening the legs will further increase speed.
- Bringing arms closer into the torso while keeping them forward will also increase speed but will create a smaller balance point which can more readily cause instability and lead to corking.

Decreasing Speed

- Widen arms to create stability.
- Widen legs, bending the knees to create more surface area on the calves to give the slowest fall rate however keep symmetrical,
- Ensure movements are strong and smooth to maintain stability.

7.4.2 Forward and Backwards Movement:

- Forward movement is generated by pointing the chin to move the head forward and gradually driving the hips forward. This will create airflow on the back of the legs and head which will drive the flyer forwards.
- Backward motion is exactly the opposite. Drive the hips gradually backwards and pull the chin in. This will create airflow on the front of the legs and head which will drive the flyer backwards.

7.4.3 Turns

Apply pressure to the leg opposite the direction of the intended turn. For example, to turn left; apply pressure to the back of the right leg, this will drive that side forward, creating a turn. Resist using arms in turns, they are primarily for taking docks and maintaining stability.

7.5 Daffy

Position

- Arms, head and torso the same as for straddle position.
- Arms are positioned 45° in front of the torso and slightly wider than shoulder width.
- One leg in front and one leg behind.
- The front leg should have airflow over the thigh and shin. Ensure toes are not pointed down.
- The back leg should have a 90° bend at the knee, to allow for airflow on the calf. Ensure toes are not pointed down, nor knee too bent.



7.5.1 Adjusting Vertical Speed

Increasing Speed

- Hold arm position for balance.
- Maintaining the same stance, slowly bring legs closer together.
- Bringing arms closer to torso while keeping them forward will also increase speed but will create a smaller balance point which can more readily cause instability and lead to corking.

Decreasing Speed

- Widen arms to create stability.
- Widen the stance as required to create extra drag, ensuring leg symmetry is maintained.
- Perform smooth movements to maintain stability.
- It is possible to also straighten the forward leg to create more surface area if needed, be sure not to also straighten the toes.

7.5.2 Forward and Backwards Movement

- Forward movement is generated by pointing the chin to move the head forward and gradually driving the hips forward. There should be an increase in pressure on the backwards leg relative the forwards leg. This will drive the flyer forward.
- Backward motion is exactly the opposite; driving the hips gradually backwards and pulling the chin in. You will feel more pressure on the front leg than the back leg. There should be an increase in pressure on the forwards leg relative the backwards leg.

7.5.3 Turns

Turns in Daffy are generated with the lower portion of the forward leg. To turn left, move the leg from the knee down towards the right. This will displace the air and create a right turn. To turn right, the opposite; move the lower leg to the left.

It is only using the front leg to generate the turn in either direction.

Resist the urge to use arms! Arms should principally be used for taking docks and maintaining stability.

7.6 Shelf

Position

- Arms, head and torso the same as for straddle position; arms are positioned 45° in front of the torso and slightly wider than shoulder width.
- Both legs are behind the body.
- Use the thighs and shins for lift.
- Be mindful not to point the toes or push down too far as this can cause instability and corking.



7.6.1 Adjusting Vertical Speed

Increasing Speed

- Hold arm position for balance.
- Keeping the same stance, slowly bring legs closer together.
- Bringing arms closer to torso while keeping them forward of the torso will also increase speed but will create a smaller balance point which can more readily cause instability and lead to corking.

Decreasing speed

- Widen arms to create stability.
- Widen the stance as required to create extra drag, ensuring leg symmetry is maintained.
- Perform smooth movements to maintain stability.
- Be mindful not to bend too far, as this can cause instability and corking. Instead, concentrate on widening the thighs.

Forward and Backwards Movement

- Forward movement is generated by pointing the chin to move the head forward and gradually driving the hips forward. This will create pressure on the back of the legs and head, driving the flyer forwards.
- Backward motion is exactly the opposite; drive the hips gradually backwards and pull the chin in. This will create pressure on the front of the legs and head, driving the flyer backwards.

7.6.2 Turns

Turning in the Shelf position can be performed in two ways. Turning the head in the desired direction will create a turn. Alternatively, if the flyer uses their hands to push against the relative wind, they will turn in the opposite direction to the input.

7.7 Transitions

Cartwheel

- Transitions are initiated by tilting the head in the direction of the transition and then tucking in the inside arm to create more surface on the side of the body.
- Once transition is initiated; tuck legs up to chest to create momentum.
- When the flyer returns to head down position; arms return to neutral position and focus on catching the air with the legs to prevent over-rotation.

This method is the same for all positions.

Back Flip

- Transitions are initiated by tilting the head back in the direction of the transition.
- Tucking legs up to chest to create momentum and arms in closer to the torso to reduce drag.
- When the flyer returns to head down position; arms return to neutral position and focus on catching the air with the legs to prevent over-rotation.

This method is the same for all positions.

Front Flip

- Transitions are initiated by tilting the head forwards in the direction of the transition and then tucking the legs up to chest to create momentum,
- Arms are brought closer to the torso to reduce drag.
- When the flyer returns to head down position; arms return to neutral position and focus on catching the air with the legs to prevent over-rotation.

This method is the same for all positions.

7.8 Cautionary Notes

- The head down position should resemble a shuttlecock; there should be more pressure on the legs than the arms or it can become unstable.
- Due to the increased speed of head down, any movement made by the flyer increases the risk of becoming unstable or disorientated; thus, a significant increase to the likelihood of corking and having collisions.
- A helpful way to find the correct vertical angle is to look for the horizon; which should be horizontal to the flyer's line of sight.

7.9 Head-down Exercises

Once in control of the vertical position, with an absence of unnecessary horizontal movement, it is recommended to start developing skill in:

- Performing turns on the vertical axis.
- Head-down to head-down transitions with a front/back loop, and side transitions.
- Carving should not be attempted until competency is achieved in the above exercises

For these exercises, emphasise the quality of the execution of each individual part of the movement.

PART 8 - THE RECOMMENDED BASIC TRAINING (RBT)

Aims and Objectives of RBT

The purpose of RBT is to enable pathways to more skilled and safer participation in freefly jumps with appropriate progression standards and expectations.

An aim of RBT is to provide a guide and competency standard for flyers and DZSO's to readily understand.

It is also the aim of RBT to introduce a structured framework to allow flyers and DZSO's to modify jumps to suit the abilities of those taking part.

It is recommended that no skydivers participate in a freefly jump with an inexperienced group before completion of the RBT or equivalent.

There is an established danger with inexperienced jumpers attempting more than they should. This is not to say that jumpers who are competent at recovery and head-up flying should not plan a head-up dive, nor that flyers shouldn't try new things. However, it does mean that they should not attempt head-down until they have been able to demonstrate some of the preliminary competences and shown a grasp of the knowledge required to begin learning safely.

Having completed a large number of jumps is not the criteria of competence in freeflying, rather it is that the jumper has practiced and assimilated the skills required for a given jump.

Evaluation Criteria

1. Knowledge of Specific 'Freefly Safety Rules' (start of this manual).
2. Understanding the dangers of "corking".
3. Resuming the "recovery position" with ease.

8.1 Angles

The flyer must demonstrate an understanding of:

- Jump runs and load compositions.
- Basic in-air navigation, including the effects of various wind conditions and how to determine suitability of opening locations.
- Speed and heading control.
- Stability in turning.
- Correct approach methods.
- The ability to adopt the correct recovery position as second nature.
- Safe break off procedures.
- The importance of no erratic or unpredictable flying habits or techniques.

8.2 Head-up Position

The flyer must demonstrate an ability to:

- Maintain equilibrium with ease.
- Control rotation through each axis.
- Control levels and proximity.
- Adopt the correct recovery position as second nature.
- Perform safe break off procedures.
- Eliminate erratic or unpredictable flying habits or techniques.

8.3 Head-down Position

The flyer must demonstrate an ability to:

- Maintain the vertical position without instability.
- Control rotation through each axis.
- Perform proper reaction to loss of position.
- Adopt the correct recovery position as second nature.
- Perform safe break off procedures.
- Eliminate erratic or unpredictable flying habits or techniques.

8.4 Break Off & Tracking

The flyer must demonstrate an ability to:

- Remain altitude aware and initiate appropriate break off.
- Go into a progressive efficient track.
- Maintain heading and complete a safe barrel roll for visually checking airspace.

8.5 Freefly RW Training Table - Head-up

Head Up 1 Linked exit. Break and face off with coach.
In Place, front flip to show they can recover
Coach Backs off, Student moves forward to face off with Coach.
Coach Moves up, student follows.
Coach moves down, student follows.
Student initiates break off at agreed height and demonstrates a safe and smooth transition to a track while checking airspace for a clear flight path.

Head Up 2 Unlinked Exit into Head up.
Coach to hold base and student to approach and face off within 5 metres.
Hand to hand dock.
Coach signals for 360
Hand to hand dock.
Student initiates break off at agreed height and demonstrates a safe and smooth transition to a track while checking airspace for a clear flight path.

After Head-up 1 and 2 are completed to satisfaction of a Freefly Coach, a note must be made in the trainee's logbook with the Coach's signature. The trainee is then allowed to jump in groups larger than three in head-up position.

After head-up 1 is completed to the satisfaction of a Coach, a trainee can begin head-down training table.

8.6 Freefly RW Training Table – Head-Down

- Head-Down 1** Linked head down exit. Break to face off with coach.
360 in place, stop.
Coach backs off, student moves forward to face off with coach.
Coach moves up, trainee follows.
Coach moves down, trainee follows.
Flyer initiates break off at agreed height, turns 180 and demonstrates smooth transition to track.
- Head-Down 2** Unlinked Exit to head-down.
Coach to hold base and student to approach and face off within 5 metres.
Hand to hand dock.
Coach signals for half transition to head up.
Coach signals for half transition back to head-down.
Hand to hand dock.
Flyer to initiate break off at agreed height, turns 180 and demonstrate smooth transition to track.

Once head-down 1 and 2 are completed to the satisfaction of a Freefly Coach, a note must be made in the logbook and the trainee is now able to jump in groups larger than three.

It is highly recommended that newly passed freefly candidates fly a number of jumps in smaller groups before attempting groups larger than five.

8.7 Training Table - Angles

Angles Level 1

Minimum three jumps for the flyer to show competency and consistency in all listed skills.

Maximum 3-way including Freefly Coach/DZSO approved leader.

Angles up to approximately 60 degrees.

The flyer must demonstrate the following skills before progression:

- Stable exit.
- Safe approach to Freefly Coach or approved leader in assigned slot.
- Good heading, speed, pitch control and dock.
- Fly over the top of Freefly Coach or approved leader to dock on opposite side.
- Stability in turning.
- Safe breakoff procedure.

Once the flyer has demonstrated these skills to the satisfaction of the Freefly Coach/approved leader and with the DZSO's written endorsement (OR 9.9.2(c)(ii)), the flyer may participate in up to 5-way Angles in the body orientation passed (belly/back).

Angles Level 2

The flyer requires a minimum of Certificate Class C.

The flyer must demonstrate the following skills before progression:

- Brief and lead jump under supervision of a Freefly Coach/DZSO approved leader.
- Unlinked Exit and navigate off jump run.
- Effective control of speed and pitch.
- Perform barrel roll, recover, and continue on heading.
- Initiate break off at agreed height and demonstrates a safe and smooth peel off while checking airspace for a clear flight path.
- Understanding of flight path.
- Able to explain break off techniques/importance.
- Thorough understanding of weather conditions, including wind directions.
- Responsible for group size depending on skill.
- Able to fly for the group.

Once the flyer has demonstrated these skills to the satisfaction of the Freefly Coach/approved leader, the flyer may;

- participate in angle groups larger than 5 ways (Must have a Star Crest for groups larger than 10), and
- may lead groups with the approval of DZSO.

Note: OR 9.9.3(b) leaders of Angles groups larger than 8 must be a Freefly Coach or have more than 300 Angle jumps and the approval of the DZSO.