

Australian Parachute Federation Incorporated

**A GUIDE TO
BEGINNING FREEFLYING**



STATUS: EDUCATIONAL

Price

This handbook is offered free to APF Members.

About this publication

This Handbook is produced by The Australian Parachute Federation (APF) for the information of APF members. If you want more information or copies of this manual (or others listed above) for yourself or your friends, please ask the instructional staff at your DZ or contact the APF Office.

Disclaimer

Skydiving and Parachuting are dangerous. Performance of some of the actions described in this manual may result in injury or death, even if performed as described.

Formation Skydiving and Relative Work are not an exact science and techniques may change. Information in this manual may not be applicable to all types of manoeuvres, freefall operations or canopy descents.

This manual has been produced for the information and assistance of APF members. It is not a do-it-yourself guide to skydiving but should only be used while under the supervision of a qualified APF AFF instructor or tutor. Individual skydivers should check the information in this manual and assess the risks involved before carrying out any of the manoeuvres described.

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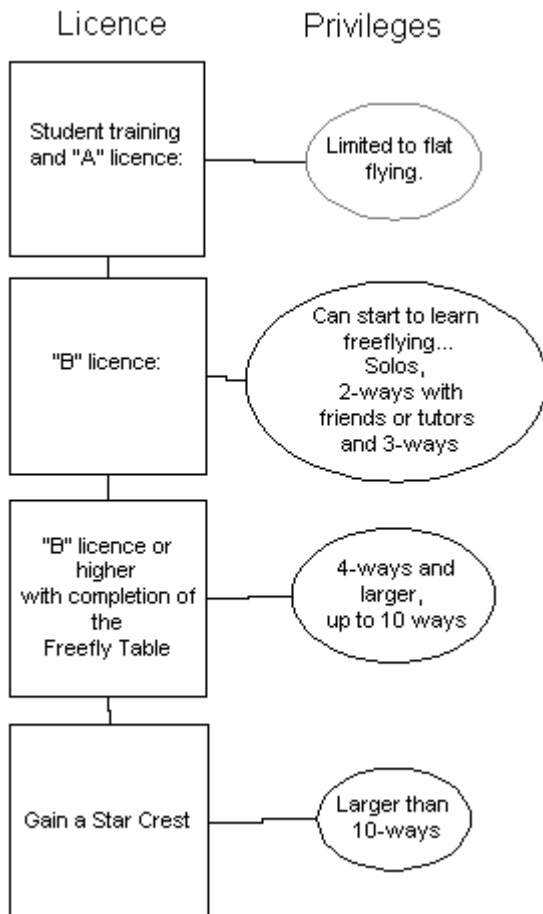
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1. Introduction

Freely means learning forms of body flight in different orientations: Head-up, Head-down, Tracking, back flying, belly flying and following diagonal trajectories. To achieve this it is necessary to have a good understanding of the body's aerodynamics in freely.

A novice freelyer should gain experience: of the relative wind striking their body in different places other than on their belly. It is useful to experiment with aerial movement through several of the body's axis. A good starting point would be performing front and backloops and/or barrel rolls, starting from and returning to the familiar "belly-to-earth" position. It is also recommended that you obtain some Formation Skydiving experience. This is certainly very useful for developing your general flying skills.



In Australia you need a Certificate "B" before starting freely jumps. This means you have already learned and demonstrated basic control in the "belly-to-earth" orientation and understand and have demonstrated tracking and deployment skills. These are your survival skills. To get to a safe place to deploy your parachute and then to open it from a stable "belly-to-earth" position are not optional requirements. This is "must know" stuff.

It is possible to learn to freely on your own, but the fastest and safest way to progress is to jump with an experienced, qualified instructor/tutor. You can alternate solo jumps with coaching jumps, in this way you consolidate what you have learned before moving on to the next step. Note: Freelyers who have not been endorsed by their CI as having completed the Freely table are limited to 3-way freely jumps. Examine Part 11 Division 4 of the Op Regs for details.

These basic skills will help you to complete the requirements of the Freely Training Descent Table (Part 4.4.6 of the Op Regs).

Once you have completed this to the satisfaction of a Freely Tutor you may participate in 4-way and larger freely jumps.

For larger than 10-ways you will need a Star Crest.

Safety in freely requires attention to your parachute equipment and clothing. For many years parachute harnesses have been developed with "belly-to-earth" flying in mind and although recently equipment manufacturers have been improving their products for freely, an accidental deployment at freely speeds is a dramatic and dangerous incident. If you do freely, maintain your equipment with this in mind.

2. Freefly Safety Rules

Ensure you have a full safety briefing from a qualified instructor at the Drop Zone that you are intending to jump at.



2.1. Parachute

Your rig must be in excellent condition, accidental deployments have resulted in serious injuries!

- No student equipment. No rigs with twin, rear pin reserves.
- Hand-deploy BOC (bottom of container) or pull-out system is mandatory. No legstrap throwaways or exposed bridles.
- Excellent condition of the spandex BOC pocket, to avoid a premature opening. Make sure the pilot-chute is a good fit.
- Tight riser covers (tuck-in flaps recommended, if velcro is used it must be in excellent condition).
- Secure main and reserve flaps (tuck-in flaps recommended, if velcro is used it must be in excellent condition).
- Cutaway and reserve handles secure.
- Closing loops (main and reserve), sufficiently tight and in a good condition
- Automatic activation device (AAD) is highly recommended although mechanical devices such as an FXC 12000 are unsuitable.
- Elastic bungee in between leg-straps is recommended to prevent the legstraps moving up your legs towards your knees while in a sit position.

2.2. Goggles, Altimetry & Helmet

- Goggles tight and secure.
- A visual altimeter is mandatory.
- One audible altimeter is mandatory, a second is recommended.
- A hard helmet is mandatory until “C” licence and highly recommended for everyone else (especially beginner freeflyers regardless of other experience). Also very important so that you can hear your audible altimeter.
- A single point release system is recommended for camera helmets but the strap must also be secure (as with all helmets).
- Do not jump with a helmet equipped with a camera bracket WITHOUT using the camera (the bracket is a sharp dangerous object and possibly a safety hazard).

2.3. Clothing

- Purpose designed clothing or jumpsuits are best.
- Avoid clothing that may open in freefall (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)

2.4. Harness fitting

- The harness should be tight enough to avoid it moving during freefall.
- Pay particular attention to your chest strap and make sure you do it up tight and secure the loose end.

2.5. On Exit

- The recommended minimum altitude for a freefly jump is 3000m/10,000ft.
- The group order for exit should be decided to obtain a maximum separation between the groups according to experience.
- You should know that RW (flat) flyers have more drift than freeflyers (because they have a longer time in freefall). It is therefore recommended that with headwind conditions or with no wind, freeflyers should exit after flatflyers.
- Note: in high upper headwinds the amount of separation depends on the amount of ground covered by the aircraft, NOT the time between exits.
- Ask a local instructor about exit order, some Drop Zones have specific rules regarding this.

2.6. In Freefall

- Freeflying involves much higher vertical speeds than flat work. This higher vertical speed can translate into faster and further horizontal movement. Understanding of this matter is essential to avoid a collision in freefall.
- Make sure you are always aware of your altitude. During a freefly jump you are moving much faster towards the ground than any other jumps!
- Always work 90° from the jump run axis (whether you are alone or in a group).
- Always keep visual on the other members of your group especially at break off.
- Avoid radical level changes (for example going onto your belly) when you are working the vertical – and learn the Recovery Position so you can maintain your vertical speed before working with any other freeflyers, no matter what their experience.

2.7. Height awareness

- Be aware that different attitudes will effect how your altimeter reads. While on your back a chest altimeter will read slightly low. (As a comparison Airtec allow for a 300 foot low reading by a Cypres on your back when you are “belly-to-earth”).
- You are required to have more than one reference but altimeters can stick and audible warning batteries can go flat. Your eyeballs can be a good back-up if you practice looking at the ground as a height reference occasionally.

2.8. Break Off and Opening

- Minimum break off altitude for more than a two-way group is 5,000ft.
- Minimum break off altitude for a two-way is 4,500ft.
- Before break off visual awareness is critical, i.e. 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 the chapter on “Learning Tracking”
- If possible always track 90° to the jump run.
- Perform a barrel roll to check there is no one above you, prior to opening.
- If someone is below you at break-off height and you are clear and safe, then - PULL!
- After opening fly your canopy 90° from the jump run. This allows free space for the skydivers who have jumped after you. Do this until you can see the groups that jumped before and after you.

2.9. 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).

3. Recovery Position (RP)

3.1. Corking

If you hold a cork under water and let it go it will suddenly shoot up to the surface. This “corking effect” is widely used to describe a dangerous freeflying situation whereby a flyer in a fast Head-up or Head-down position loses that position and instinctively assumes a much slower belly-to-earth position.



Generally, experienced belly flyers who have years of flying in a good arch position, may find they are more prone to “corking” while initially 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.

Normal speed for belly flying is about 200km/h. Freeflying speeds are around 260 km/h, but are sometimes in excess of that. If while freeflying you become a bit wobbly and suddenly revert to a belly-to-earth flying position then you will rapidly slow down. You will then shoot upward relative to everyone else you are jumping with, and a high speed collision may occur, possibly causing injuries to the “corker” and anyone else they come in contact with. You need to learn to make yourself “cork proof”. Keep your speed up.

The best way to avoid corking, is by learning early on to develop a Recovery Position” that you can use to keep a high fall rate if you lose your vertical flying position during the skydive. A modified sit position is considered to be one of the good recovery techniques. This is a reason why learning to “Head-up” and “sit-fly” first is a good idea.

3.2. Recovery Position

[[Image:gtbody recovery.png|width150px|right]]

Here are some tips to help learn this type position:

1. Sit on the floor with your back against a wall.
2. Feet close together
3. Knees up toward your chest
4. Heels tucked toward your butt with your feet flat
5. Place your arms out to the sides and back a little.
6. Try it in freefall.

You will find the position tends to fall more back-to-earth depending on your arm position.

The “Recovery Position” provides a Head-up orientation with planet earth and will assist you with a faster recovery, regaining your situational awareness. From this you can easily manoeuvre to a sit / stand up position or transition over to a Head-down without corking.

3.3. Zooming

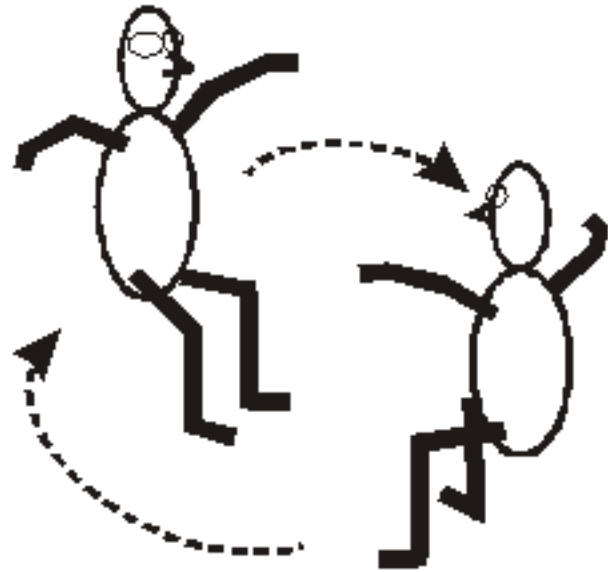
Zooming is an unintentional and sudden horizontal movement. At worst, zooming can be like a very steep, fast track forwards or backwards. It may occur if your body teeters from the knife-edge vertical position momentarily. This means there is also a risk of collision with people who may be a reasonable distance horizontally from you. If it can't be stopped as quickly as it started, then a transition to a good recovery position may be needed.

If you find yourself approaching someone at speed and aren't sure you can stop in time, turn off heading so that you pass by them (or glance off) rather than colliding with them directly.

3.4. Orbiting

Unplanned Orbiting is not a huge safety problem with small groups such as a 2-way. It may create problems further down the track if attempting bigger ways beyond your level of skill. Orbiting is also associated with inexperienced skydivers developing their belly flying skills. The orbit tends to be faster with freeflying due to increased fall rates.

As the name suggests, orbiting is when you slide around a point, like a satellite around the Earth. When two people orbit, they unintentionally rotate around the center of the formation. As an unskilled freeflyer, you may progress from orbiting to zooming, and then corking.



Orbiting will develop when the two freeflyers fly toward each other and don't stop. They will then pass and while they are looking at each other will start turning toward the center. The orbit then develops as they try to fly toward each other again.

The best way to prevent it is by deliberately stopping your turn. Pick a point on the horizon if necessary. Keep your partner in sight but not by following them progressively around. Even reverse the turn if its quicker to get back to a face off.. Then move slowly together.

It is very important to have this worked it out before progressing to 3-ways or bigger, as progressing from 2-ways to 3-ways potentially doubles the complications that can occur.

4. Learning to Fly Head-up

4.1. Head-up Position on Exit and in Freefall

The easiest way to exit Head-up is to present your back to the relative wind (ie. facing the tail of the plane).

In freefall you can enter a Head-up position from the Recovery Position, which you have developed in earlier jumps.

The parachutist should pay particular attention to the angles of their limbs and back. A beginner falling out of their position should return to the Recovery Position, regain control and then attempt a Sit Flying position again.

It is better to start from the slowest and progress to the faster positions, i.e. sit to intermediate position, to stand. Working on these stages will enable you to control your fall rate. The aim is to achieve a controlled, vertical, symmetric position.

4.2. The Head-up flying position

“Sit” loosely describes how the position looks. Like sitting upright in a chair.

However, Head-Up flying feels different to sitting in a chair. While you sit in a chair all of your weight is on your butt. When you fly Head-up you push your feet down onto the air, and you need to concentrate more on your feet and leg positions. Consider yourself flying in a seated position, rather than thinking of sitting down.



90 degree Sit

To position your body for Head-up flying think 90 degree sit. Generally bend everything at 90 degrees and it will fall into place. The following more detailed description you can perfect as you progress.

- Feet- Soles of your feet flat, parallel with the ground, pushing down against the relative wind, spread at least shoulder width apart.
- Shins- Aligned straight up and down, perpendicular with the ground.
- Knees- bent 90°, thighs parallel with the ground, about shoulder width apart.
- Back- Upright.
- Arms- Held up out to the sides, shoulder height.

This is a neutral Head-up position allowing you to fall straight down. You must also be symmetrical. The position can be practiced by sitting on a kitchen chair facing the backrest with your legs on either side.

Perform the same thing while leaning back against a wall, you will get more of an idea of the feeling of pushing down with your feet while keeping them, and your thighs, parallel with the floor. Freefall won't be as hard, but it gives you an idea of the effort.

When in a sit position in freefall, the upper body is generally used for turns and horizontal movement and the lower body for fall rate.

4.3. Common problems

Common problems when learning to fly Head-up

- Height awareness
- Shoulders and arms quickly becoming tired
- Feet and knees too close together

Fall out of the Head-up position and onto the back?

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 forcibly holding them down in the correct position. Should have no direct air hitting your calves or your shins.
- Arms too far forward
- Back not straight

Fall out of the Head-up position onto the belly?

Possible causes:

- Knees bent less than 90°, the heels toward the butt and wind on your shins.
- Back not straight

Uncontrolled spinning?

Possible Causes:

- Lower legs not straight up and down. Feet should be directly beneath the knees as if to block the air. If the feet are slightly to the side then you will get air hitting you in the side of the lower leg and it will turn you.
- Arms not symmetrical. One arm higher than the other.
- Legs too close together.

If there is a stability problem like the ones described above, then you can always snap straight into your well practiced recovery position, and then try again.

Head-up Exercises

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

For these exercises you should emphasise the quality of the execution of each part of the movement.

- Forward and backward movement is achieved in Head-up flight by pushing the hips forwards or backwards in relation to the upper torso.
- Pushing hips forward creates a forward movement and vice versa.
- Attention should be paid to working on levels when moving in a horizontal direction.

A few jumps with an instructor/tutor will prevent you from acquiring bad habits and will help you to achieve a correct basic position.

Exits

With your first attempts at flying Head-up, keep it simple. Exit the aircraft facing the rear, with your back against the relative wind, arms up and out to the side.

You may want to have your legs tucked up in the recovery position as soon as you leave so they don't have any effect on the exit. Try and relax, feel the wind. When you are ready, position your legs correctly.

More advanced exits involve leaving the aircraft in the Head-up position immediately. It is harder to do, so just keep it simple for a while.

Adjusting Fall Rate

- Arms- used for minor fall rate correction.
- Legs- used for more major corrections.

Faster

- Arms-relax and let the airflow push them up
- Legs- push down on your feet, slightly straightening legs while bringing them closer together.

Slower

- Arms- push down against the relative wind.
- Legs- widen and raise slightly.

4.4. Turning

There are several techniques for turning. One of the easier methods is arm turns

Arm turns

Involves “banking” your arms, deflecting the air and turning around your feet. It is a very simple method, but may cause a little confusion at first. The key to focus on for this method of turning is that your feet are the pivot point, and your body turns around the feet.

Try it while sitting on a chair with good wheels.

- Adopt a sit flying position.
- Look over your right shoulder and imagine that you want to turn so you are facing that direction.
- To turn right, bank your arms to the left. Yes, the left. Left arm down, right arm up. Your upper body will deflect the air to your right, moving your upper body in the opposite direction to the left and as you pivot around your feet you will turn right.
- Don't move your feet at all. Keep them anchored on the same spot of the floor, get a friend to move you by your torso, sliding the chair to the left around your feet. You will find that this is turning you to the right. Confused. Try it several times, turning left and right, keeping the feet neutral and in the same spot on the floor.



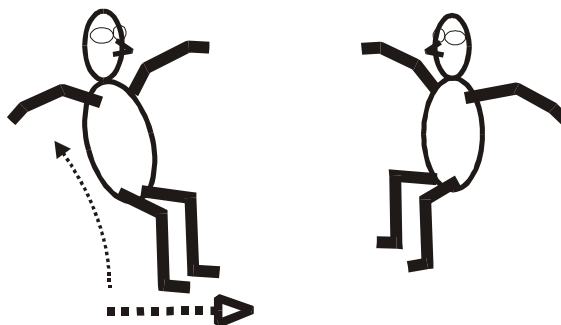
4.5. Horizontal movement

Forward

The main body part that has greatest effect for forward movement is the torso.

Torso

- Leaning back slightly will deflect air off your back and propel you forward. For stand ups this is very effective way of moving forward also.
- Resist going into a reclined position as you will not get effective forward drive and your fall rate will slow.
- When you get to doing some docks on somebody you will find that you may need to lean back slightly during the dock to maintain positive pressure on the formation.



Feet

- Keep your feet parallel with the ground.
- Be strong with the legs. You may have to push down a little harder and a little further to stop your legs from coming up, and to maintain a constant fall rate.
- Do not let the airflow lift your thighs up. Keep them in a strong, seated position. This will direct more air behind your legs, driving you forward.

Backward

This is not a big movement. It looks like sitting on a chair while tilting it forward as you hold a neutral Head-up position. The movements to achieve this is directly opposite for forward movement. It may feel a more awkward at first.

- Lean forward. This will tilt the whole body forward deflecting air off the front, driving you backwards.
- Keep your knees apart so the chest is exposed to the relative air.
- Keep the thighs level, you may need to adjust feet down to maintain the freefall speed.
- Horizontal movement is easily stopped by moving back to the neutral position

5. Learning Tracking

You should have already become proficient at tracking during your student training and subsequent jumps. You can never become “too good” at tracking, it is a skydiving survival skill as well as being a lot of fun.

5.1. Belly and Back Tracking

This first section is mostly aimed at either a deliberate tracking exercise or tracking dive.

Before attempting any tracking jump ask a local instructor about the current wind conditions before deciding which direction to track in.

Check whether any other groups on your load are doing a tracking jump and make sure all of you are aware which direction each group is heading in (this will be in opposite directions to one another).



A useful exercise is to start to become efficient in tracking on your belly (you should be reasonably proficient from your basic training), once you feel confident you can start to perform barrel rolls.

Progress to practicing a Back Tracking position and then, alternate between flying on your back and your belly.



Make sure that you maintain the same heading throughout the whole jump (90° to the jump run).

It's important to keep a check on the distance you are covering and consider opening higher.

Tracking is a basic technique known by all skydivers but it is also a discipline in itself within freefly.

Poor tracking position

May be caused by trying to video or watch following jumpers in a tracking jump. Being flatter in the air is the key to horizontal movement.



Fast tracking position

By looking forward to the horizon a really fast track can be developed.



5.2. Tracking after freeflying

Progressive tracking

Corking is undesirable and potentially unsafe at any time on a freefly dive and this includes at break-off.

From whatever orientation you find yourself in, you should develop a smooth, controlled transition to a track. This is termed a "progressive track" and may involve transitioning through the “recovery position” as described below.

A progressive track can typically take up to 5 seconds to fully transition from the vertical to the horizontal and provides a safe method for gaining separation at break-off time. There are several methods that you may use in different circumstances and you will probably develop several different transitions to horizontal movement depending on your orientation at the end of the vertical part of your skydive.

Remember, keep it simple at first, you are at the bottom of your skydive, this is not the time to try some radical rotation you haven't practised a lot higher.

The wave off

Signal for break off by saluting with one or both hand(s) or using a pre-agreed head movement.

If you are not alone this should have been covered in the pre-brief.

Have a good look above you and side to side. If you can't see the other person(s) then complete a 360° turn.

Assuming you are facing inwards to the center of the group, then this is one method of transitioning to a track:

Back track method

Adopt the Recovery Position

Bring your arms forward slightly. This will sit you on your back.

Gradually straighten your legs and start back tracking away.

Tilt your head back

Ensure the airspace is clear above you and barrel roll over onto your belly.

Flare and deploy.



6. Learning to Fly Head-down

6.1. Safety!

You can try to fly Head-down alone or with an instructor/tutor. NEVER attempt it first with an unqualified freeflyer who suggests they jump with you to be your reference in Head-up!

In this case neither flyer will have enough knowledge or experience to ensure safe proximity during the jump. The risk of a high-speed collision becomes a serious concern!

A high-speed collision may result in serious or fatal injury of either or both jumper

6.2. Head-down Position on Exit and in Freefall

The best way to exit Head-down is to present your body, head on to the relative wind, keeping your entire body straight and fluid.

In freefall you can enter this position from Head-up by performing a half cartwheel and then opening into a 'legs-wide' Head-down position.

Whilst learning Head-down, the position should be maintained for a few seconds only, 4 to 5 seconds maximum.

When aiming for the vertical you must always be aware of your body angle to prevent any fast and uncontrolled horizontal movement.

Return to Head-up or the Recovery Position in between each attempt.

Check your heading after each exercise. Make sure you are working 90° from the jump run.

6.3. Head-down flying styles

There are several basic styles of Head-down and they all work. Your own style will develop into something that will combine the influences and training from your tutor and other freeflyers. In all of them, the head, shoulders and torso remain vertically aligned. Here are some examples.

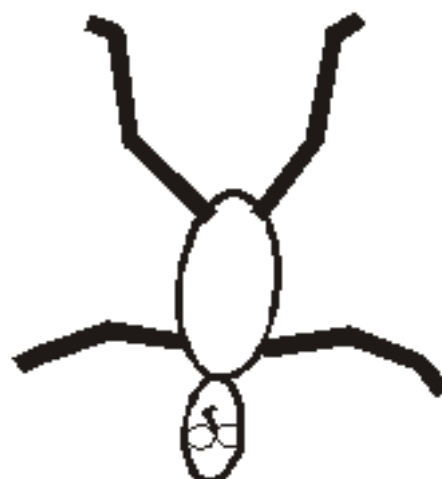
The “Straddle”

Legs are spread, pushing out side to side.

Advantages:

- Good leg position for docking
- Not reliant on arms for control.
- Excellent range of control for flying forward or backward.

After you have done a few jumps you may even consider combining the two techniques 50/50 to give you some of the advantages of each style.



The “Daffy”

Also may be known as the “mantis”. Legs are wide apart, one leg out in front of the torso, and the other is at the rear.

Advantages

- Quite resistant to zooming forwards or backwards
- Can get the legs very far apart providing good fall rate range and stability.

6.4. Head-down Exercises

Once you are controlling the vertical position, with an absence of unnecessary horizontal movement, you can work on:

- Performing turns on the vertical axis.
- Head-down/Head-down transitions with a front/back loop, and side transitions.

For these exercises it is important that you emphasise the quality of the execution of each part of the movement.



7. The Recommended Basic Training (RBT)

7.1. Aims and Objectives of RBT

Initially RBT enables you to participate better and more safely in two-way freely jumps.

You can then progress to larger groups according to the level and experience of the other flyers.

It is recommended that no skydivers are allowed to participate in an inexperienced group freely jump without RBT or equivalent. Consequently, this should be looked on as a guide to jumpers and DZSOs so that a standard of competence is established for participation in a particular skydive or so that the skydive is modified to suit the abilities of the skydivers taking part.

The danger is that two or more inexperienced jumpers will attempt 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 or that nobody should ever try anything new. But it does mean that they should not include Head-down (for example) until they have demonstrated some competence or plan to fly with an experienced jumper or tutor and that new things should be introduced in small doses and at the top of the skydive.

In freely having lots of jumps is not the criteria of competence, rather it is that the jumper has practised and learnt the skills that are to be included in the jump.

To satisfy the evaluation criteria of RBT you should be able to demonstrate the following:

7.2. Evaluation Criteria

Knowledge of Specific 'Freely Safety Rules' (start of this manual).

Understanding the dangers of "corking".

Resuming the "recovery position" with ease.

Head-up Position

- Maintain equilibrium with ease.
- Rotation through every axis.
- Controlling levels and proximity.

Head-down Position

- Being vertical (No time limit).
- Working in full safety.
- Visual control according to reference.
- Respecting axes.
- Proper reaction to loss of position.

Break Off & Tracking

- Altitude awareness and initiate break off.
- Go into a progressive efficient track.
- Respect heading and barrel roll visual check.

8. Freefly RW Training Table

8.1. Head Up.

- Head Up Level 1** Linked exit. Break and face off with Tutor.
In Place, 360, stop.
Tutor Backs off, Student moves forward to face off with Tutor.
Tutor Moves up, trainee follows.
Tutor moves down, trainee follows.
Trainee 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 Level 2** Unlinked Exit into Head up. Tutor to hold base and trainee to approach and face off within 5 metres.
Hand to hand dock.
Tutor signals for front loop.
Tutor signals for backloop.
Hand to hand dock.
Trainee to initiate break off at agreed height, and demonstrates smooth transition to track while checking airspace for a clear flight path.

Once both Head Up 1 and 2 passed to satisfaction of Tutor a note must be made in Logbook and Trainee allowed to jump in groups larger than three in Head Up position.

8.2. Head Down.

Head Down 1

Linked Head down exit. Break to face off with tutor.

In Place, 360, stop.

Tutor Backs off, Student moves forward to face off with Tutor.

Tutor Moves up, trainee follows.

Tutor moves down, trainee follows.

Trainee initiates break off at agreed height, turns 180 and demonstrates smooth transition to track.

Head Down 2

Unlinked Exit to Head Down.

Tutor to hold base and trainee to approach and face off within 5 metres.

Hand to hand dock.

Tutor signals for front loop.

Tutor signals for half transition to head up.

Tutor signals for half transition back to head down.

Hand to hand dock.

Trainee to initiate break off at agreed height, turns 180 and demonstrates smooth transition to track.

Once Head down 1 and 2 completed to satisfaction of Tutor a note must be made in logbook and trainee now able to jump groups larger than three.

Highly recommended that newly passed freefly candidate fly a number of jumps in smaller groups before attempting groups larger than five.