LASKUVARJOTOIMIKUNTA

SKYDIVERS GUIDE

FINNISH AERONAUTICAL ASSOCIATION
PARACHUTING COMMITTEE
15.2.2022

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INTRODUCTION

Welcome to the skies

Skydiving is not that crazy extreme sport it usually is considered. Of course, skydiving has risks involved just like in any other extreme sport, but skydiving is much safer than people usually think.

There are laws, rules and regulations from the Finnish Aeronautical Association (SIL Ry) that are built by the active members of the community with decades of experience. If used and maintained correctly, equipment used in skydiving is safe and works as intended. Modern skydiving as a sport is risk management as its finest.

Usually, problems are the outcome of a mistake made by the skydiver. Training program for skydiving is controlled and approved by the Finnish Aeronautical Association and it is used nationwide. Instructors are jump masters, coaches or otherwise experienced skydivers.

Majority of training in Finland happens in clubs around the country. There is also commercial skydiving in Finland.

During the course student goes through all the different parts of skydiving so the student can achieve a successful and safe first skydive and have fun while doing it. All the things thought during the course needs to be understood, so the jump will succeed.

All the lectures and exercises are crucially important for your own safety, so if you are unable to attend some of them, contact your instructor and make plans for another session. You can also practice certain parts of the training at home, this way you can focus better on the things that are not that clear to you. The actual jump can and should also be mentally practiced before the actual jump.

If something is unclear to you, please ask right away. Everything in the course needs to be clear to you when you jump. Things learned in the course are new to everyone, and there are no such thing as stupid questions. There are also a lot of terms used by the more experienced jumpers that might be unfamiliar to you, some of these are in the attachments on this guide. If you don't understand something, ask!

You might have dreamt a long time about skydiving or just recently started thinking about it. Either case you are about to start a hobby that brings many memorable moments in the sky and on the ground. Whether you do only a couple of jumps or stick with us for years, we guarantee that you will not forget your first jump!

Finnish Aeronautical Association (SIL ry)

Founded in 1919 Finnish Aeronautical Association is a head organization for different aeronautical sport associations. There are over 200 (2021) member associations, and 12 of them are mainly for skydiving. Association that is offering student training has agreed to use guidelines approved by SIL.

Aviation is controlled by aviation authorities. SIL ry gives its members own guidelines and works as a bridge towards the authorities (Finnish transportation and communications agency Traficom) for example:

- Help as an expert on skydiving
- Creating a training program for skydiving and offer updates on it to the members
- Monitoring trainings done by member associations
- Creating statistics regarding skydiving
- Gather and analyze reports on accidents and dangerous situations
- Grant a skydiving license

SIL ry has published an Ilmailu -magazine since 1938. Magazine comes 6 times a year and has on top of member association related things also commercial and military related articles and topics regarding aviation safety.

On day-to-day issues SIL Ry operates on Malmi airport in Helsinki. You can get more information on their website www.ilmailuliitto.fi.

Parachuting committee (Laskuvarjotoimikunta)

In the aeronautical association there is a committee formed by active skydivers to help and support with their expertise on skydiving, this is called the Parachuting committee (Laskuvarjotoimikunta, LT).

Parachuting committee takes care of equipment, competition, skydiving safety and -training related issues and jump-flying operational issues. Committee website is www.laskuvarjotoimikunta.fi.

Insurance

Every year there are some injuries, most commonly a sprained or broken ankle caused by a bad landing.

Skydiving is always done at your own risk. Clubs have third party liability insurance that works only when there is a mistake made by the club. If a student makes a mistake and causes harm to him/herself or someone/something else, the student has to take care of it by him/herself. Finnish Aeronautical Association offers insurance that includes third party liability and insurance in case of an accident.

Regular insurance usually does not cover skydiving, since skydiving is considered an extreme sport, so you might have to take extra coverage on your insurance.

Additional coverage can be used from your own insurance company or just use the one offered by the Finnish Aeronautical Association. See for more information from *Dear student parachutist* brochure. If you have any questions about the coverage, you can call directly to Finnish

Aeronautical Association office (09) 350 9340. Finnish Aeronautical Association recommends insurance that covers skydiving.

Health requirements

Skydiving is a sport and requires physical and mental performance and good health. If you have any medical condition that causes loss of consciousness or ability to function or require constant treatment, these will prevent you from jumping.

During the course you will fill out a health assurance. From people over 65 years old it is required to provide a statement from a doctor. Training organizations can require a doctor's statement from their members to prove sufficient ability to jump.

Skydiving training

First jump course - First step

First jump course gives you the necessary tools and knowledge to do your first jump safely and it also gives a foundation for basic- and advanced training. Tight curriculum requires activity from your part and repeating already learned skills multiple times. Listen, ask and figure things out.

First jump course can be done either with AFF (Accelerated Free Fall) or a static line (SL) method. Both methods are explained and separated in this guide. Most of the training is the same regardless of the first jump course method.

First jump course aims to teach you how to act in the plane, how to perform an exit, controlled freefall (in AFF), deployment of the parachute, flying the canopy to the landing area and safe landing. A lot of time is spent also learning about dangerous situations and practicing the emergency procedures.

Your first jump is either on a static line (SL) from a 1000m or in accelerated free fall (AFF) training a self-deployed jump from 2700–4000m. Before that you have to pass practical exams on exit, parachute landing fall (PLF), emergency procedures and a written exam. After these you are ready to perform your first jump with an instructor.

Instructor supervises and reviews all your jumps and makes a note about them to your logbook and either passes or fails the jump. If a jump is a failure, that means you have to do it again and pass it before advancing to the next jump. You need to always receive training before a jump. In this guide (Parts I–III; plus, parts IV–VI are for guidance after receiving your A -license) is material you will be using during the first jump course, basic- and advanced training. From the Finnish parachuting committee website (*koulutuspäälikön kansio*) you will find this guide in an electronic format that includes a lot of links (internal and external) and pictures with colors.

First jump course

First jump course in SL method aims to teach you how to deploy the parachute by yourself eventually and in AFF method also learn basic maneuvers during freefall. After the first jump course is done, you will do a written exam and do a recap of dangerous situations and emergency procedures.

Basic training

Basic training aims to teach you a stable freefall with different maneuvers and routines, such as turns, flips and back flying. After these you will do a written exam and show that you can perform a gear check. You will also recap dangerous situations and emergency procedures. After these you will be transferring to advanced training. Now you don't need an instructor to jump with you, also a coach (*vapaapudotuskouluttaja, VPK*) can jump with you.

Advanced training

In this phase you already are an independent student, and you don't necessarily need an instructor or a coach with you on the plane. You will be practicing different disciplines such as formation skydiving and freeflying. You will be focusing on accuracy landings, and you are allowed to use gear that is not designed for student skydiving.

Most important goal is to learn a foundation for safe group skydiving. At the end you will be doing a written theory exam and a test about packing and checking a parachute. There will also be a recap about dangerous situations and emergency procedures.

Your journey as a student end with a check dive where you show in practice that you possess required skills and knowledge to be a licensed skydiver. After the check dive an instructor grants you a A-license.

A license

After a successful student training you can apply A-license from the aeronautical association (SIL ry).

A license skydiver has a right to skydive in Finland within the limits and regulations set by the aeronautical association, law and the club. Finnish A license also helps you to skydive abroad.

PART I – FIRST JUMP COURSE

1a AFF First jump course

First jump course is valid for a year from the date it is issued. If it expires, the student has to retake the theory exam and practical exercises before jumping. Emergency procedure exam is valid for two months. Students have to achieve learning objectives on each jump so the jump can be passed.

1a.1 AFF Program

Level 1 – Getting familiar with freefall (6a.2)
Level 2 – Control of your body (6a.3)
Level 3 – Stable freefall (6a.4)
Level 4 – Turns, 90 degrees (6a.5)
Level 5 – Turns, 360 degrees (6a.6)
Level 6 – Unlinked floating exit – barrel roll, back flip (6a.7)
Level 7 – Diving exit – front flip, back flip, turns 360 left and right (6a.8)
Level 8 – 15” short freefall (“ = second) (6a.9)

1a.2 Other tasks, AFF

- Learn to pack a student canopy: *t7 Packing a student canopy* and practical exercises and theoretical trainings throughout the student career.
- Written theory exam, study material: II Basic training excluding chapters 8b (Static line) and 15b (Static line). Recap of emergency procedures and dangerous situations.

1a.3 Time limits, AFF

If a student has more than 30 days in between jumps, the student has to retake the previous jump. During levels 4–7 instructor can choose some of the previous jumps excluding levels 1 and 2. Level 8 has to be done within 14 days after level 7, otherwise level 7 has to be jumped again. If there is more than 3 months between jumps, recurrency jump cannot be more advanced than level 3.

1b Static Line (SL) Program

First jump course is valid for a year from the date it is issued. If it expires, the student has to retake the theory exam and practical exercises before jumping. Emergency procedure exam is valid for two months. Students have to achieve learning objectives on each jump so the jump can be passed.

1b.1 SL program

- 3 Static line jumps (6b.1)
- 3 Practice pulls (6b.2)
- 3” Self-deployment (” = second) (6b.3)
- 5” Self-deployment (6b.4)
- 10” Self-deployment (6b.5)

1b.2 Other tasks, SL

- Learn to pack a student canopy: *t7 Packing a student canopy* and practical exercises and theoretical trainings throughout the student career.
- Written theory exam, study material: II Basic training excluding chapters 8a (AFF) and 15a (AFF). Recap of emergency procedures and dangerous situations.

1b.3 Time limits, SL

- If a student has more than 30 days in between jumps, the student has to jump a recurrency jump before the next jump. Recurrency jump depends on the previous jump completed:
- Static line or practice pull.

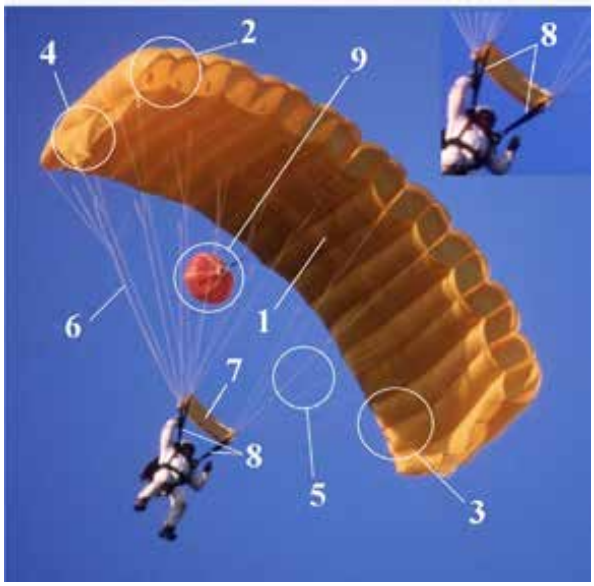
2 Parachute and other equipment

2.1 Harness and canopy

Parachute contains a harness and two canopies: main- and reserve canopy. Both of them are ram air parachutes that are shaped like a wing. The glide ratio is about 3:1, so when the canopy glides 3 meters forward, it descends 1.

2.1. Wings-harness.

2.1.1 Main canopy



2.2. Main canopy parts: 1. canopy 2. tunnel 3. tail 4. stabilizer 5. lines 6. steering lines 7. slider 8. risers 9. pilot chute.

Main canopy consist of canopy itself, lines, slider and it is attached to the harness with raisers by 3-ring system. Canopy is built with tunnels where the other end is closed. Lines are measured in a way that the nose of the canopy is slightly lower than the tail for optimizing the angle of attack. Ram air parachute generates lift the same way wings does in an airplane.

2.1.2 Reserve canopy

Reserve canopy is similar by structure than a main canopy. Reserve canopy deployment happens with a spring assisted pilot chute that is released when the handle is pulled. Deployment of the reserve parachute is assisted with multiple ways, such as reserve static line (RSL) and automatic activation device (AAD). Packing technique for a reserve canopy is different from a main canopy, so reserve canopy can be packed only by a certified person. Different packing technique assures quick and safe deployment.

2.2 Harness

2.3. 1. Adjustment 2. Cutaway handle 3. Reserve deployment handle 4. Chest strap 5. Reserve static line (RSL) 6. Hook knife (location might vary) 7. 3-ring release system 8. Automatic activation device control unit (location might vary between systems) 9. Leg straps.

2.4. 10. Main deployment handle 11. Main canopy container 12. Reserve canopy container 13. Security flap for a pin/cable 14. Instructor deployment handle (AFF handle / MOD).

2.5. 10. Static line 11. Main canopy container
12. Reserve canopy container 13. Security flap for a pin/cable.

2.3 Accessories

On top of main- and reserve canopies there are devices and accessories to add safety. Main function of these accessories is to make sure the reserve parachute deploys.

Reserve Static Line (RSL) makes sure the reserve parachute is deployed once the main canopy is cut away from the harness. The system connects a main riser to the reserve deployment system.

Jumper can disconnect the RSL by releasing a quick lock from the riser in case of for example a water landing (5.5).

When main risers are detached from the three-ring system after a cutaway (4.4), main parachute pulls the RSL and deploys the reserve parachute. However, RSL is only an accessory, it does not deploy the reserve, if the main canopy is not deployed and cut away. Jumper needs to always pull the reserve deployment handle manually!

2.6. 3-ring release system.

2.7. 3-ring release system is open.
Main canopy riser is pulling the reserve static line while detaching.

Another accessory to help with a reserve deployment is Automatic Activation Device (AAD). There are two different types of AAD's used: Electronic (for example Cypres and Vigil) and mechanical (FXC). These devices are meant to deploy the reserve if a skydiver is falling too fast too low. Both devices are configured to work in pre-set altitude (around 300m).

With students, only an instructor can configure the AAD. FXC has a JUMP/OFF switch that needs to be set on JUMP at all times.

There are two situations where FXC JUMP/OFF switch is turned to OFF:

- When landing with a plane, ordered by an instructor
- Landing to water (5.5)

2.8. Cypres AAD.

2.4 Other gear

- Hard shell helmet, where the chinstrap is attached on the outside of the shell.
- Radio is used on three first jumps.
- Goggles protects the eyes from the airflow.
- Jumpsuit that does not have any pockets that can snag on something or anything a skydiver can accidentally pull instead of a deployment handle. Under the jumpsuit skydiver wears clothes that are fitting for the current weather and does not prevent movement.
- Gloves are required for a student. They need to be warm, but not too thick and slippery.
- Shoes that are suitable for skydiving. No hooks or other snag hazards.
- Altimeter that is reset on the ground. Altimeter is attached to the wrist or the chest strap.
- Hook knife that is used in case of entanglement with lines or another jumper in case of a collision.
- Life jacket is worn if the instructor insists if there is a real possibility of drowning.

During the jump it is prohibited to have any unnecessaries, such as keys, pens or a mobile phone. And always when skydiving, you need to have your logbook with you.

2.5 Handling your gear

Protect your rig from sun, moist and dirt. Lift your harness from shoulder straps and avoid grabbing on any of the handles or protective casings. You should not throw around your gear or

pull them across the ground or sit on top of. Don't smoke near your gear, parachutes are made from materials that are destroyed easily.

Packing is overseen only by a person who has a skydiving license or other certificate issued by the Finnish aeronautical association. Parachute that is used by a student the packing and packing checks are written down. Reserve parachute can be packed only by a person who has training to do so. Once you're done, return your gear where it belongs instructed by your dropzone.

2.6 3x3-check

Later in training students are trained to do a wholesome gear-check, but once in the self-deployment phase the gear-check can be narrowed in to 3x3-check (three times three):

1. Check that there are **three** buckles:
   - Left leg buckle
   - Right leg buckle
   - Chest strap buckle
2. Check that there are **three** handles, and they are attached:
   - Main deployment handle
   - Main cutaway handle
   - Reserve deployment handle
3. Check that 3-ring system (1st and 2nd check-point) and RSL is correctly attached (3rd checkpoint).

Also check that AAD is on, and flaps are closed. If the flaps are open or there are other reasons to suspect, also main- and reserve pins are checked. Before the exit, check also altimeter reading and goggles are in place.

3 Jump

3.1 Preparing for the jump

Skydive does not begin when you leave the plane. To have a successful jump it is important to focus on preparing well. Decision to jump should be made already on the previous day, this way you have time to prepare mentally for the jump. Sufficient amount of sleep and food is essential, since focusing is much harder when you are tired or hungry.

Before adding yourself to the manifest you should gather all your gear and then you are added to the load. Gear should be tested and required adjustments done with enough time to do them properly. Jump should be practiced alone or with your instructor.

If it is possible to follow other jumpers before your load, you can see the upper winds and their effect on canopies so you can prepare mentally on your own jump and work with the winds.

Before boarding the plane instructor makes a gear check, and after that do not adjust your gear without permission from your instructor! Instructor goes through the current landing pattern according to current winds before walking up to the plane. Students walk up to the plane only with an instructor. Approach the plane only from behind.

3.1.1 In the plane

Usually, the plane is loaded in a reversed order, meaning that the one who is boarding the plane first, jumps last (instructor is an exception). Boarding has different rules on different clubs, and they are told to you before your jump. Always follow the instructions given by the instructor. Maintaining the balance of the plane is extremely important for safety, if the weight balance is wrong, the plane might stall and stop flying.

Protect your gear in the plane so nothing gets entangled with anything. Be especially careful with the deployment handles when you or someone else is moving around. If you feel that something is stuck, do not pull yourself free with force, notify your instructor. Avoid unnecessary movement in the plane. If the plane has seat belts, keep them attached until the instructor gives you permission to open them. If you notice anything wrong during the flight with the plane, your or someone's gear, notify your instructor right away.

Focus on your own jump. Mind others and do not bother while they are trying to focus on their own jump. Pilot is the chief of the plane, but your chief is your instructor. When approaching the jump run the plane flies a line according to current winds. Instructor checks your gear well before the exit.

3.2 Exit Cessna 206, Static Line (SL)

Instructor calls “DOOR!”, you move carefully to the door and take the exit position. Instructor calls “GO!” you launch from the plane, arch well, take the delta position and start counting.

Your shoulders should stay in line with the line of flight.

3.1. Jumper is moving to the door to an exit position.

During the exit it is easy to accidentally start looking to the ground. If you are looking to the ground instead of the plane, your arch easily turns to the wrong direction. Human body usually turns towards where you are looking at, so when during the exit you look up to the plane, your body usually automatically arches the correct way. Arching starts from the pelvis (also neck and back).

Arching is the most important part of exit. In delta position your arms are about 45 degrees from your body to the sides and shoulders back. Legs are kept in shoulder width and only slightly bent.

Counting is important to learn early on. Practically it is the only way to keep your sense of time during this phase of training. Counting happens out loud (one-one-thousand, two-one-thousand …. five-one-thousand). During the exit practicing you practice the correct rhythm and not just count numbers. In the air a couple of seconds can feel like a long time.

3.2. Skydiver has launched from the plane.

Key things for successful exit are:

- Good set up to the door (eyes up to the plane).
- Sufficient launch and shoulders to the line of flight.
- Good and symmetrical delta position, good arch and eyes on the plane.

3.3 Exit, strut plane (SL)

When instructor gives a command “DOOR!”, move to the door. Command “GO!” gives you permission to go hanging from the strut and take a good exit position and then let go while maintaining good arch and X -position and start counting. Your chest should stay oriented towards the direction of the plane.

3.3. Skydiver has moved to the strut and has taken the exit position.

While exiting the plane, ground is usually pulling your sight towards it. If you look down to the ground instead of the plane, the arch will most likely turn the wrong way. If you look to the plane while exiting, it helps you to maintain a good arch. Arch starts from the pelvis (also back and neck).

If your arch disappears suddenly, it is easily fixed: by arching.

Most important thing while exiting is arching. In X -position your arms are held high and wide, shoulders bent back. Your legs should be spread about shoulder width apart and only slightly bent.

Counting is important to start early on since it is the only way to keep your sense of time at this point of training. Counting should be yelled out loud (one-one-thousand, two-one-thousand). While exit practices, you are practicing a correct rhythm, so you are not counting just numbers, you are counting seconds. While skydiving, only a couple of seconds might seem a really long time.

3.4. Skydiver has launched from the plane.

Successful exit:

- Drop your legs one by one to the air. Don't jump.
- Place your hands shoulder width apart to the strut and maintain symmetrical body position (X -position).
- Release your hands simultaneously from the strut and keep your chest towards the line of flight.
- Maintain symmetrical X -position, good arch and look at the plane.

Problems:

- Bant legs might cause a backflip.
- Negative arch turns you on your back.
- If you jump from the step, your hands might slip from the strut.
- Launching by using your hands might turn you to your back

3.4 Exit, AFF

Instructor gives a command **"GET UP" / "MOVE"**

Prepare to move towards the door. Instructor gives the command **"DOOR!"**

Instructor helps you to set up at the door. Both instructors are holding on to you while you are at the door, and the inside instructor might give you additional instructions on setting up at the door.

When you are ready, look towards the inside instructor and do an exit check. Speak out loud and clearly:

“CHECK IN”

This way you make sure the inside instructor is ready when he nods or shakes your harness. Wait until the instructor gives you a signal that he/she is ready, and you can continue. Move your sight towards the outside instructor and yell:

“CHECK OUT”

This way you make sure the outside instructor is also ready. Wait until the instructor gives you a signal (shake on a harness or a nod) and then you can continue. Once both instructors have given you a ready signal, you can start your exit count. Count might vary between used aircraft.

WING/PROPELLER

Keep your eyes fixed to a wing or propeller (depending on the aircraft type)

UP

Move your body upwards

DOWN

Move your body downwards

ARCH

Launch yourself from the plane maintaining the eye contact with the plane as long as possible, this helps the exit. As soon as possible after the initial launch put your arms and legs to symmetrical freefall body position. Start counting out loud (one-one-thousand, two-one-thousand…..five-one-thousand).

Counting is important to start early on since it is the only way to keep your sense of time at this point of training. Counting should be yelled out loud (one-one-thousand, two-one-thousand). While exit practices, you are practicing a correct rhythm, so you are not counting just numbers, you are counting seconds. While skydiving, only a couple of seconds might seem a really long time.

3.5 Freefall basics

If you are on a **static line course**, you can move to section *“Canopy deployment, checking and clearing”* (3.7) and return to this section (and section about deploying 3.6) when you are moving towards self-deployed jumps or you are learning how to use hand-deployed pilot chute.

Earth gravity is the reason why the speed accelerates in a freefall. Resistance from the airflow causes the speed to settle around 180-190 km/h (50-53 m/s).

Next table shows the average speed of a skydiver (towards the ground) and fall amount since the start of the jump. The actual speed varies between jumpers and is affected by the weight, body position, clothes and the exit altitude.

Seconds	Speed (m/s)	Fall (m)
1	5	5
2	14	19
3	23	42
4	32	74
5	38	112
6	42	154
7	45	200
8	48	250
9	50	300
10	51	350
11	52	400
12	53	450
15	53	600
20	53	880
25	53	1140
30	53	1410
35	53	1670
40	53	1940
45	53	2200
50	53	2470
55	53	2750
60	53	3000

3.5. Average speed and fall over time.

During student jumping always start your deployment sequence latest at 1300m, if you have deployed lower, you need to inform your instructors.

3.5.1 Using altimeter during freefall

Visual altimeter must be used always during skydiving. Only exception is a planned water landing, when the exit altitude does not exceed 1500m. Altimeters work by measuring change in air pressure. Air pressure descends around 1 mbar / 8 meters upwards.

Static line students start to practice altimeter usage during freefall when they do their 10 second freefall jump. During 10 second freefall jump students count only as a precaution while the altimeter determines the deployment altitude. Check the altitude every five seconds at least.

AFF students are using an altimeter starting from their first jump. Check the altimeter throughout the jump at least every five seconds.

Altimeters are divided between two main categories, visual and audible altimeters. Visual altimeter is used by reading the exit, break-off, deployment, decision and canopy altitudes. Audible altimeter is set to give warning in a specific altitude(s).

Visual, metric altimeter with a hand indicator is the only acceptable altimeter throughout the student career; licensed skydivers can use altimeter with a digital display. Altimeter and how it is used is taught during the first jump course.

3.5.2 Using altimeter

While using an altimeter following things needs to be taken in to account:

- Altimeter is placed so it can be read at all times
- You need to be able to maintain good body position while reading the altimeter
- You read the altimeter by turning your head
- You read the altimeter by the position of the indicator, not by reading numbers
- You need to be aware of the time passing by, since the altimeter might be broken
- If altimeter does not work during the jump, deploy right away while paying attention to other jumpers
- Altimeter is calibrated to be most accurate around deployment altitude. Minor differences might occur in higher altitudes

3.5.3 Malfunctions / errors

Most common malfunctions with altimeters are:

- Altimeter is not set to zero on the ground.
- Air pressure differences during freefall.
- Frozen altimeter due to a moist or condensed water in the altimeter.
- Getting stuck due to a collision or dirt.
- Mechanical problem that is caused by dropping the altimeter or stepping on it.
- Depleted batteries.

Knowledge on how to set an altitude offset is required if the landing area is on a different altitude than takeoff area.

3.6 Deployment

3.6.1 Deployment priorities

Deploy the parachute. During self-deployment jump the most important thing is to deploy the parachute by yourself.

Deploy the parachute at the correct altitude. On every jump there is predefined deployment altitude where the parachute has to be deployed.

Deploy at a stable body position. Try to deploy your parachute while in stable freefall position, but more important is to deploy at correct altitude.

3.6.2 Deployment systems

Spring loaded pilot chute

Spring loaded pilot chute is attached with a bridle to the deployment bag and further to the parachute. Spring is either cone or a cylinder shaped. Pilot chute is completely F-111 -fabric or partially veil. The bottom is either open or closed. Deployment with a spring-loaded pilot chute happens by pulling a ripcord. Once deployed, keep the ripcord handle in your hands and place it somewhere where it stays well (under a chest strap, through chest strap buckle or under your jumpsuit).

Hand deployment pilot chute (HD pilot chute)

While using a hand deployment system, the pilot chute is thrown in to the airflow. If the pilot chute is tossed while turning or spinning, it always causes deployment problems, such as line twists. If body position is not stable while deploying, it is easier for the pilot chute to get tangled with the gear or a limb than a spring-loaded pilot chute.

Students who have started with a spring-loaded pilot chute need to get training before transitioning to a hand deployment pilot chute. Student need to be able to control the deployment in a stable body position while maintaining the heading. After the training students need to be able to throw the hand deployment pilot chute far enough so the burble caused by the jumper is not affecting the pilot chute.

At least during the first hand deployment jump there should not be other plans for the jump. After the first jump with hand deployment pilot chute students should not go back to spring loaded pilot chute.

While using hand deployment system following things needs to be considered:

- Deployment body position is stable and on heading.
- Take a good grip from the handle with your right hand, left hand moves in front of you.
- Pull the pilot chute out straight to a free air flow, extend your arm completely.
- Throw the pilot chute to a free air flow and return your arms back to the basic body position.
- Start counting and do not look over your shoulder before five-one-thousand.

3.6. *Using a hand deployed system.*

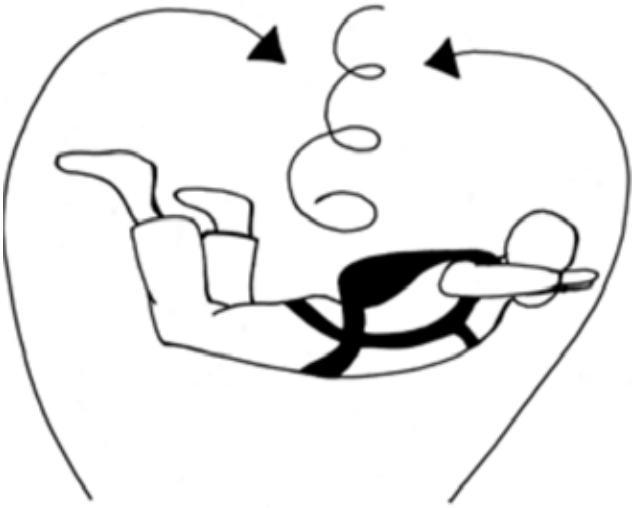
3.6.3 Problems

- Unstable body position, arm(s), leg(s) curled in → Flip to the side or to back to earth position → Possibility to entangle with deploying parachute.
- Pulling the harness / Hard pull / No pull → Main parachute is not deployed → Try again (once) or perform the emergency procedures.
- Pilot chute entangles with the jumper → Try to shake it off once if you can see it → If not successful, perform emergency procedures.
- Jumper is entangled with the lines → Try to clear yourself from the lines, use a hook knife if necessary → Perform emergency procedures.
- Pilot chute might sometimes come from the front side of the canopy → Perform steering tests → If the parachute does not steer normally, perform emergency procedures.
- Uncontrolled deployment position → Deploy the main parachute right away.

- Pilot chute in burble:
  While deploying the pilot chute might get stuck on a burble that is on the jumpers back caused by the airflow passing around the jumper. If after counting five seconds nothing happens, peak over your shoulder. While doing so your body position turns slightly on your side and the pilot

chute should get clean air. If the parachute does not deploy, perform emergency procedures since the pilot chute might be entangled with something or there might be a baglock. You can try to untangle if you can see the problem, if you can't solve it by one try or you can't see the problem, perform emergency procedures right away.

- Horseshoe malfunction occurs when container is opened before the pilot chute is thrown in to the air flow. **Throw the pilot chute to the airflow.** If the canopy does not fly, perform your emergency procedures. If you cannot locate the deployment handle, try once again, if you still can't locate it, perform your emergency procedures.



3.7. There is a burble formed behind your back.

3.8. Horseshoe malfunction.

3.7 Deployment, checking and solving if necessary

In the **static line method** attached line and in AFF hand deployed pilot chute opens the container and the deployment bag is pulled out of the container. Lines are released from the rubber bands and canopy is released from the deployment bag and starts to develop starting from the middle.

Slider slides down the lines and slows down the deployment. It leaves the checking the canopy for you.

Once you have counted to five-one-thousand, check the canopy. Canopy flies when:

- Canopy is symmetrical.
- Lines are tense.

Once you have checked the canopy take your hands to the rear risers. If the lines are twisted, open the line twists by kicking and spreading the risers (SOLVE).

Place your hands to the steering toggles and pull them simultaneously. Toggles are located on the back side of the rear risers. Take the toggles only once the possible twists are cleared.

If the slider does not come all the way down or outermost tunnels are not inflated completely, you can try to pump your toggles. Pumping the toggles should be calm and toggles should be pulled all the way down and returned back to all the way up. You can pump the toggles repeatedly if needed (SOLVE).

If the canopy DOES NOT FLY, or you are unable to SOLVE it, move straight to the emergency procedures (4.4).

Once you have checked and if necessary solved the canopy, check the following:

- **AIRSPACE** (Also while solving the canopy, steer away from other canopies or make yourself noticed by for example yelling. 5.4.2)
- **ALTITUDE** (Also while solving the canopy)
- **HANDLES** are secure and in place* (cutaway- and reserve deployment handle)
- **LOCATION** (where you are and locate the landing area)

  * If cutaway handle or reserve deployment handle is detached, perform your emergency procedures (4.4)

Start steering and if necessary, turn so you face the wind.

3.8 Steering

3.8.1 Flight statuses

Full flight

- Lift the toggles all the way up. Canopy reaches the highest horizontal speed and performs best when flying in to the wind.

Half brakes

- Pull/lift the toggles to the shoulder level. Canopy starts braking. While flying in half brake status both air- and ground speed are smaller.

Full brakes

- Pull the toggles all the way down. Canopy brakes as much as it can. Air- and ground speed are even smaller than in half braked status.

Stall

- If you pull the toggles even further the canopy stops flying. While stalling the descent rate gets much higher so do not stall the canopy in lower altitudes. Canopy recovers from the stall by lifting the toggles 10-20cm calmly. After recovery check the canopy and if necessary solve it.

Try different flight statuses of the canopy but remember to stop steering tests before reaching 600m altitude.

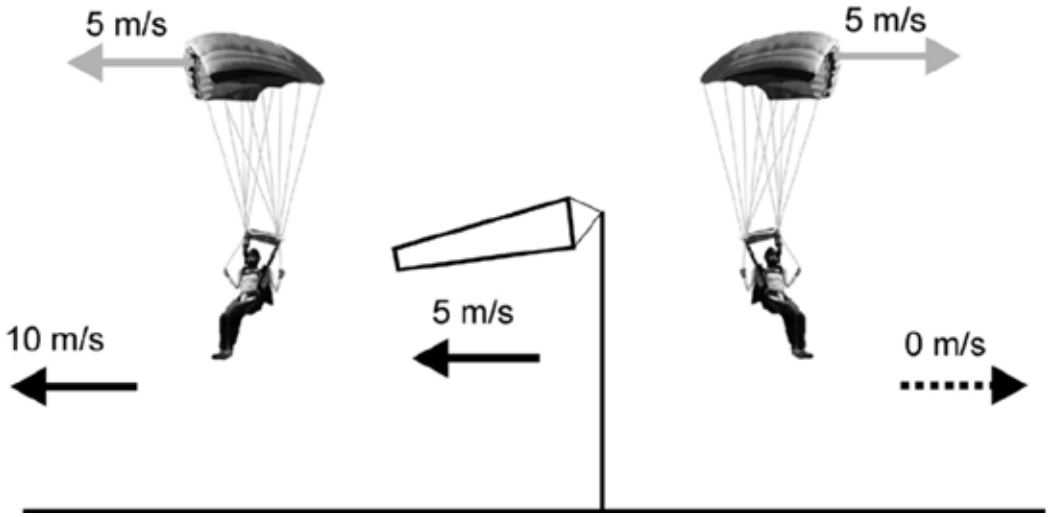
3.9. Full flight. *3.10. Half brakes.* *3.11. Full brakes.*

3.8.2 Air- and ground speed

Ram air parachute is really safe, but since its higher performance it can be dangerous if used incorrectly. It is important to understand the features and be able to control it correctly.

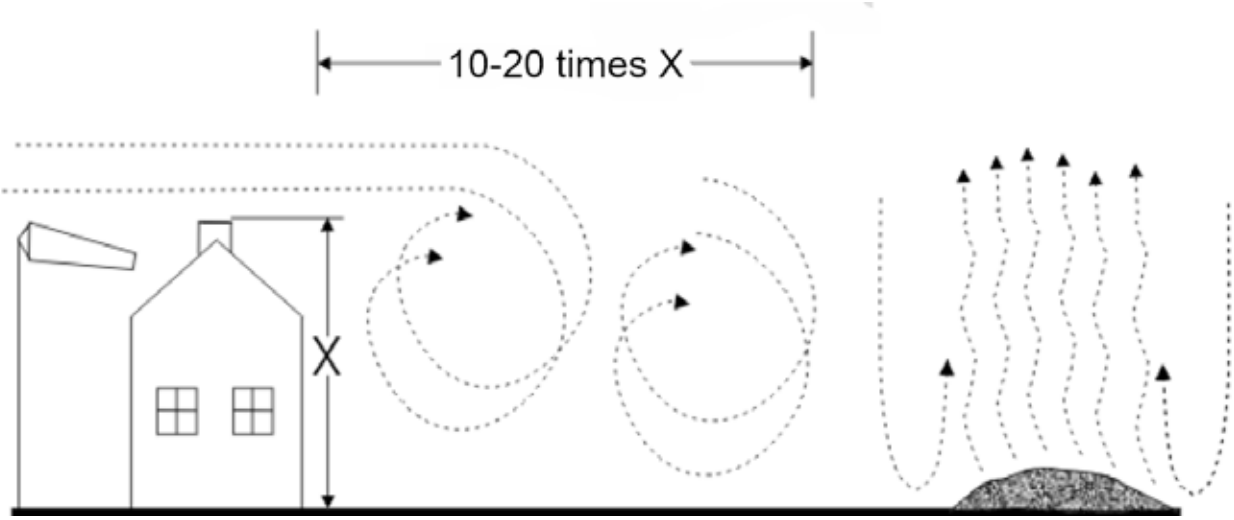
Ram air parachute is always gliding to the air with constant speed when in full flight status (around 8-10 m/s) no matter the winds.

This constant speed is called the air speed, and it does not matter if you fly to head-, side- or tailwind. Ground speed is how fast you are flying relative to the ground. Ground speed changes depending on where you are flying in relation to the winds. Ram air parachute moves faster in relation to the ground if you are flying to the tailwind compared to the headwind. This is the reason why ram air parachutes should always be landed to the headwind, if possible.



3.12. Ground speed changes depending on your flight direction in relation to the wind.

3.8.3 Turbulence



3.13. Buildings and warm spots such as asphalt, sand, rock etc. can cause turbulence.

Turbulence and uneven airflow can change the stream of air entering the tunnels in a way that the parachute loses the ability to perform. Strong turbulence can collapse the canopy partially or even completely. Collapsed canopy will refill when the canopy reaches a correct angle of attack in relation to the airflow. Turbulent weather can prevent skydiving, even though the wind speed would not be over the limit. If you find yourself from a turbulence, fly your canopy in full flight. If you are flying with brakes, turbulence might cause the canopy to collapse.

Vortex or turbulence can be any size from a couple of meters to multiple tens of meters. Vortexes are formed by a barrier that is disturbing a clean airflow, such as buildings, trees, hills and differences in temperature (lifting and descending airflow). Another canopy will cause a turbulence directly behind it.

Most dangerous for skydivers are usually turbulence caused by barriers or lifting and descending airflows. You can avoid vortexes by landing in a clear area away from places that causes changes to the temperature (sand, asphalt etc.).

3.8.4 Turning

Before performing a turn, always look to the direction of the planned turn so you know the airspace is clear.

By pulling the left toggle, the parachute will turn to left, and by pulling the right toggle the parachute will turn to right. While turning, the parachute dives to the direction of the turn, so the descent rate will get higher while turning. This is the reason why it is not allowed to perform low turns.

When turning from a full flight status the parachute has higher air speed, hence the turn radius is higher. Parachute will dive more if you pull the toggle more, and when the parachute dives more, the descent rate gets higher.

3.14. Turn from a full flight status.

Turn in half brake status happens by holding another toggle on a shoulder level and pulling another lower. Canopy turns faster but does not dive as much. Descent rate is not as high as it is in full flight turn.

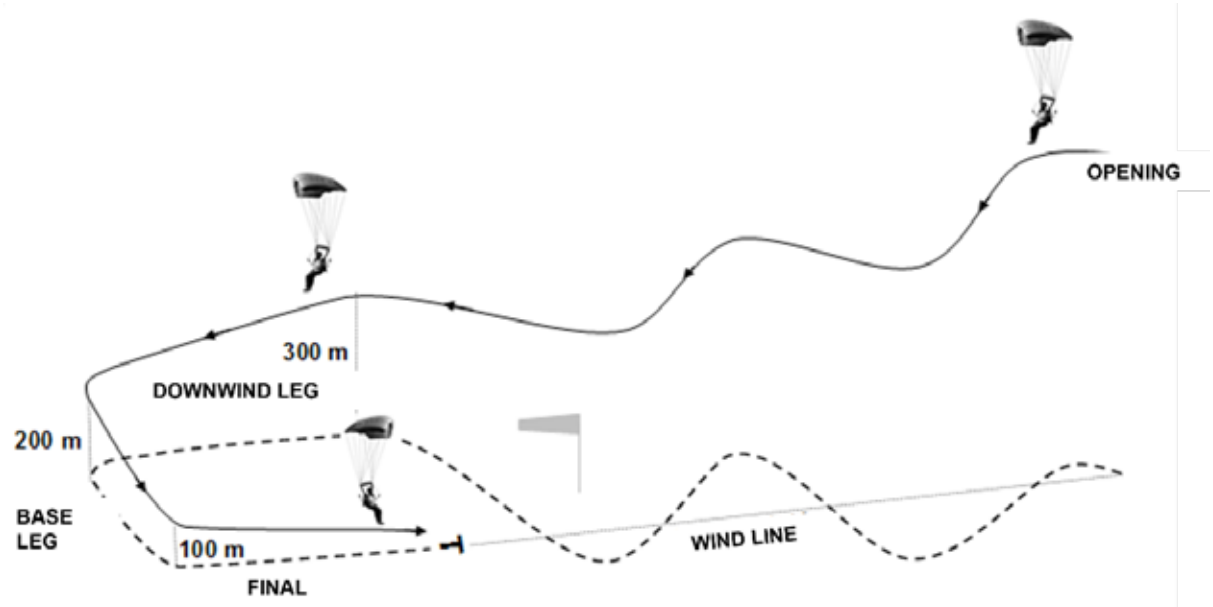
Turning in full brake status is done by holding another toggle all the way down and lifting another toggle. Canopy reacts quickly and dives less than in other turns. While performing full brake turns canopy is close to stalling, so be careful when performing turns.

3.15. Turn from a full brake status.

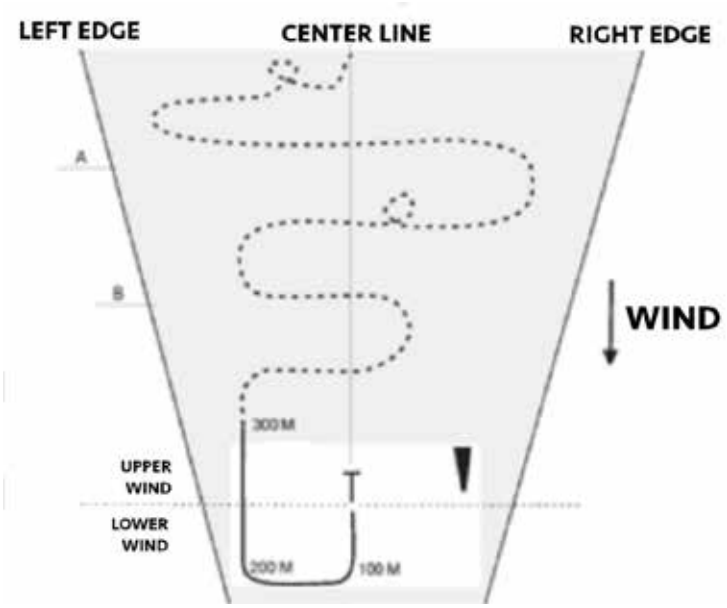
When the air speed is higher, the radius and the dive of the turn is higher.

Try different kinds of turns, do not be afraid to steer.

3.8.5 Steering to the landing area



3.16. Observational image for flying to the landing area.



3.17. Stay in the wind sector while approaching the landing area.

After performing the normal checks (airspace, altitude, handles and location) start to steer and turn the canopy to headwind if necessary so you stay in the planned wind sector and you do not drift too early on top of the landing area. Draw an imaginary line from your current position to the point where you start your landing pattern and place a couple of checkpoints along the way (picture 3.17 points A and B). Drop enough altitude before moving to the next checkpoint by for example turning to the headwind so you do not approach the next checkpoint too early. Also imagine a sideline for your planned path, and do not fly further than those lines. Then try the steering in a different flight status: full flight, half brake flight, full brake flight. Practice also the flare.

Approach the landing area while taking in to account the wind conditions and previously mentioned checkpoints. During the last 300m altitude you perform a landing pattern, that is formed by downwind leg, base and final. Most absolute part is the final, where the others are dependent on the wind conditions. Wind sector is an area that is meant to guide you to the landing area. Wind sector is on both sides of the wind line. Wind line is a line between a correct exit spot and the landing spot. Stay near the wind line. When approaching the landing area, the wind sector gets narrower.

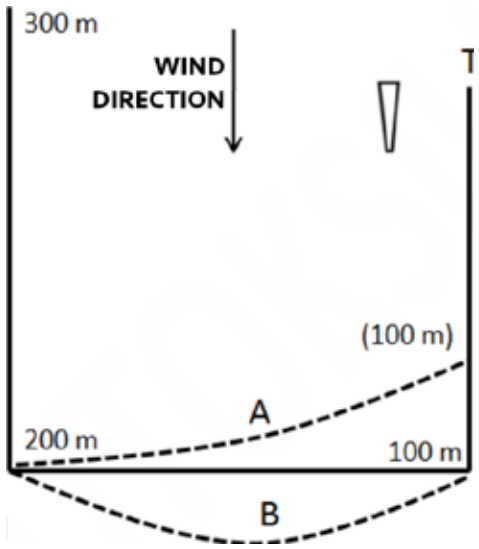
3.8.6 Landing pattern

Landing pattern is flown in a full flight status.

Downwind leg is started at 300m altitude upwind in relation to the landing spot. Distance from the landing spot is depending on the wind speed. Downwind leg is flown about 100m apart from the planned landing spot.

Base leg is a part of the landing pattern that is flown to sidewind. Turn to base leg from downwind leg at about 200m altitude. In the base leg you fly to directly behind the planned landing spot. If the wind speed is high, you need to keep facing slightly in to the wind to avoid drifting sideways. If you turn to the base leg too low, you can take a shortcut to the final, so the final gets a bit shorter.

Also, if you start the base leg too high, you can make a slight curve so you will start the final at the planned spot.

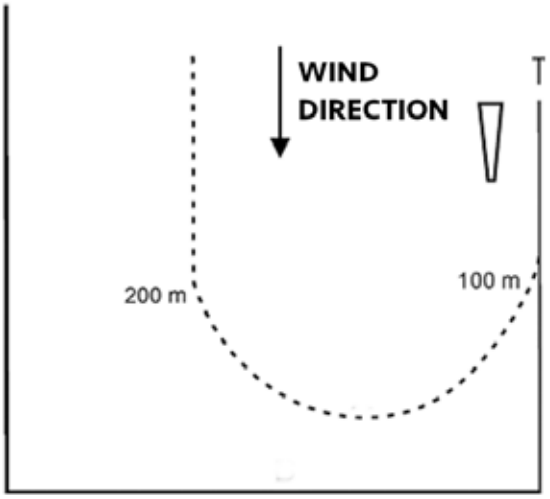


3.18. If we are too low, we can choose the path A, if we are too high, we can choose path B.

Final is started directly behind the planned landing spot. Starting point for the final depends on the wind conditions. If the wind speed is higher, the starting point for the final is closer to the planned landing spot. Final, that is flown to the headwind, is started at 100m altitude. Canopy might try to turn slightly, so you need to steer until the landing, so you directly face the headwind.

If for some reason you are facing downwind during the final, do not turn to headwind and land to the downwind. Landing to side- or downwind is safer than turning low!

Avoid making S-turns in the landing pattern. Fly predictably so others can predict your planned flight path. Keep an eye on the traffic even while flying the pattern.



3.19. When the winds are high, downwind leg is started further and landing pattern is flown closer to the intended spot. Base leg is shorter (dotted line).

3.8.7 Landing priorities

1. **Straight final** (level wing on top of your head is the most important thing).
2. **Flare** and maintain good body position to fall.
3. Try to land **headwind** and clear area.

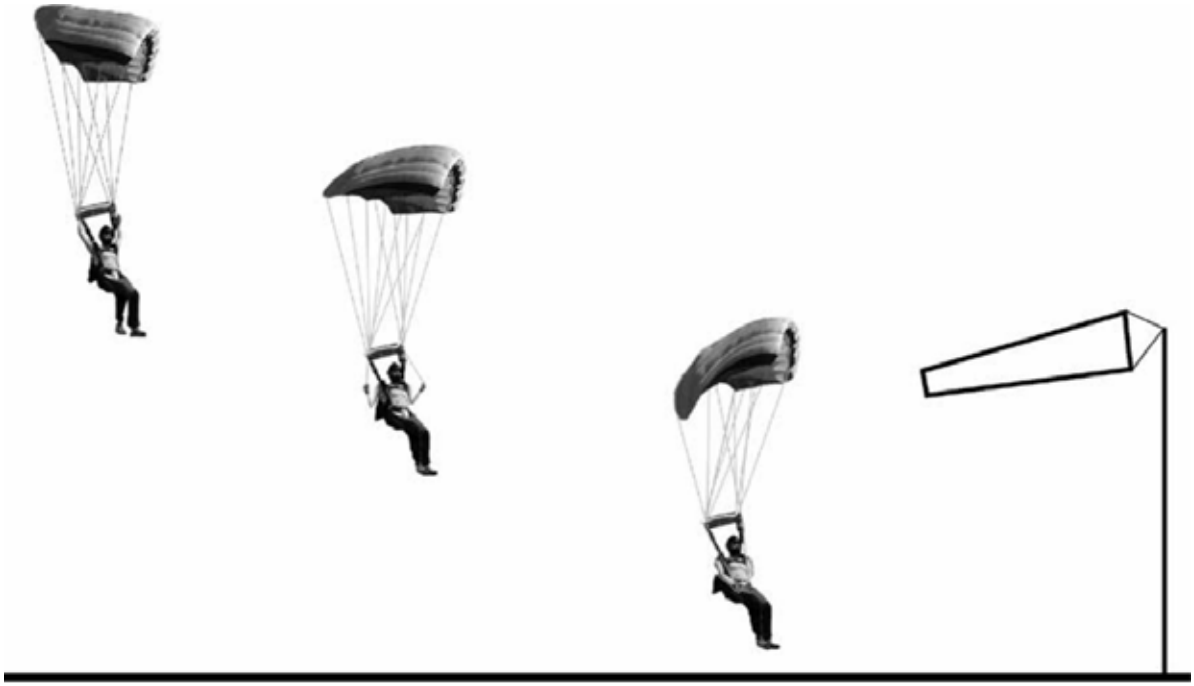
Always remember the order of these priorities, they help you to land safely!

3.8.8 Flare and landing

While you are flying the final, take a good body position for landing at around 50m altitude:

- Hands on toggles
- Knees slightly bent and pressed tightly together
- Feet turned 45 degrees from the direction of flight and pressed together
- Bottom of your feet at the same level and parallel to the ground

3.20. Body position for landing before flare.



3.21. Flare.

When you have about 2–3m of altitude flare by pulling the toggles quickly to the full brake position and press your chin against your chest.

Once you are at a level with treetops, ground might seem like it is attacking you. Do not panic and focus on a good landing body position and timing of the flare. For estimation you can use for example windsock pole, people at the landing area or surrounding buildings.

If you flare too high and your movement stops too high, **keep the toggles pulled all the way down**. Prepare to perform a Parachute Landing Fall (PLF). If you lift your toggles back up, the canopy attacks forward and you will hit the ground hard. If you don't hear the flare command from the radio, flare by yourself. If the flare timing is wrong, or flaring is not well performed, landing can be hard. That is why you **always prepare to do a Parachute Landing Fall (PLF)** (it is practiced during the first jump training).

Most of the injuries during student skydiving are sprained and broken ankles that could have been prevented by proper PLF.

Always remember while under a canopy:

- Check airspace constantly.
- Altitude awareness.
- Avoid drastic steering.
- Be aware of your location and stay in the planned area and path.
- Don't fly near other canopies.
- Canopies with lower altitude have the right of passage.
- Canopy does not turn instantly.
- Check the windsock.
- Turn to the final at 100m altitude.
- Straight final.
- Steer all the way to the ground.

3.8.9 Collapsing the canopy

After the landing the canopy might start pulling you on higher winds. You can collapse the canopy by letting one toggle away from your hand and start pulling the other towards you. You can also run around the canopy to the other side. You can turn the canopy in a way that the wind cannot get to the tunnels. If nothing else works, you can also perform a main parachute cutaway (4.4).

Do not lay on the ground if you do not need help.

If you see another jumper needing assistance, it is your duty to help them.

3.8.10 Radio commands

You have a radio at least on three first jumps. Radio is for assisting you to steer your canopy and timing of the flare. However, you should act independently, assistance is given only if needed. Radio is just an additional help, and they might not work all the time.

1. Testing the connection before boarding the plane

CALL

- Lift your arm to acknowledge.

2. Testing the connection after deployment

CALL + **SWING YOUR LEGS**

- Acknowledge by swinging your legs.

Turning

CALL + **LEFT, LEFT, STRAIGHT**
CALL + **RIGHT, RIGHT, STRAIGHT**
- Turn until you hear **STRAIGHT**.

3. Brake

CALL + **BRAKE, BRAKE**
- For each "BRAKE", lower your toggles by 10–15cm.

4. Reducing brake

CALL + **LIFT, LIFT**
- For each "LIFT" lift the toggles by 10–15cm.

CALL + **GLIDE**
- Full flight.

5. Fly by yourself

CALL + **STEER ON YOUR OWN**
- Continue to steer by yourself.
- Overwrites previous commands.

6. Flare

CALL + **FEET TOGETHER**
- Take a proper landing body position, legs tightly together.

PULL
- Pull the toggles sharply to full brake position and maintain good landing body position.

7. Other possible commands

CALL + **CHECK YOUR ALTITUDE**
- Check your altitude right away

CALL + **CHECK YOUR CANOPY**
- Check your canopy and re-assess if it flies.

3.9 Safe canopy flying during first jump course

The goal is that you will develop to be a safe skydiver under the canopy before you will receive your A-license. Safety means your own safety and also safety of others.

During your first jump course you'll get the essential info on how the parachute is controlled, how it is flown to the landing area (landing pattern) and how to make a soft landing by flaring the canopy. On top of these you are taught radio commands and how to act once you receive them.

During your progression through the student program, you are expected to survive these basic skills and also to learn more safety related things about flying and landing your canopy. This way eventually you're not only a student that everybody avoids, but a safe and independent skydiver that can fly safely with other canopies.

In this guide (this chapter 3.9, chapter 13 and chapter 17) will go through in general with different categories how you should progress as a canopy pilot on your way to your a-license.

These are only things that you will have to learn to control, this guide does not teach them completely. Your instructors will teach you during every jump.

Altitude awareness

You need to develop your judgement on how far your canopy will fly and how the wind effects on your flight. You will also need to learn different stages of canopy flight: higher altitude you're on a "holding area", and from there you move towards the landing area and towards the starting point of the landing pattern while the altitude slowly gets lower. At the end you'll fly planned landing pattern and fly the final to a pre-defined direction.

Radio jumps (at least 3 jumps)

First jump:

You can try steering according to the instructions and training you have received. Try to remember the training you have received from the aerial picture before the jump and stay within the pre-defined sector and remember the check-points given to you before the jump so you will be at the starting point of the landing pattern when the altitude is at 300m and try to fly the planned landing pattern correctly. Remember the landing priorities! Take a good landing body position at latest when you hear "*legs together*" command from the radio and perform a strong flare once you hear the "*pull!*" command.

Follow the instructions given to you from the radio. Radio instructor helps you to stay within planned sector relative to the wind and altitude.

Radio instructor also tries actively to help you fly the planned landing pattern so you will get used to them. However, you are not "radio controlled", so you should try and fly independently from the beginning. Radio is just an additional help!

Second jump:

Try to be independent. Try to remember the instructions given to you before the jump. Try to fly according to those instructions in a way that the radio instructor does not need to help you to stay within the planned sector or fly the landing pattern. Aim for the starting point of the landing

pattern at right altitude and fly the planned pattern. You will receive “legs together” and “pull” commands. Think if you would have done the landing flare before or after the command. The goal is to learn the correct timing for the flare.

Radio instructor role is smaller, instructor will give you instructions only if something is going wrong. If you hear instructions, follow them without questioning them.

Third jump:

During this jump the radio is on board only as a precaution. Try to show abilities to stay within the planned sector, enter the landing pattern correctly, take the landing body position and perform the landing flare at the right time. Instructor gives you instructions only at the last moment before something is going wrong. If you fly according to the plan and safely and land to a planned landing area with a good landing flare, instructor can release you from the radio jumps.

Jumps (4–8 AFF, 4–9 SL) before the basic training

Key words: *Altitude loss, airspace awareness, location awareness, planned landing pattern and final, correctly timed landing flare.*

Remember the meaning of the “airspace”, “location”, and “altitude” from the procedures after the deployment and canopy check. Decide on the landing area with enough altitude. Now no one can tell you if you can make it to the landing area or do you need to land off from the main landing area.

Learn to fly predictably and do not make sudden moves. Learn to observe mainly the airspace and secondly the altitude and altitude loss.

Your task is to learn to stay in a planned sector, enter the landing pattern at correct altitude and spot, fly the landing area according to the plan and land safely with a good landing flare. Still remember the landing priorities!

While you are a student, others will dodge you under the canopy, however you need to learn the rules for the canopy priorities: upper canopy always dodges lower one and possible collision is avoided mainly by dodging to the right.

4 Malfunctions

The canopy might not always be fully developed after the deployment, and it needs to be solved: removing line twists and/or pumping the toggles to inflate the side tunnels and getting the slider down (3.7). Both are completely normal actions especially during static line jumps (the reason for them might be a bad exit or a low airspeed of the aircraft). Canopy flies even if there are twists in the lines, side tunnels are not inflated, and the slider is not completely down if the canopy fulfills the criteria for a flying canopy:

- Canopy is symmetrical.
- Lines are tense.

Remember to always maintain altitude awareness, so you can perform emergency procedures in time if necessary.

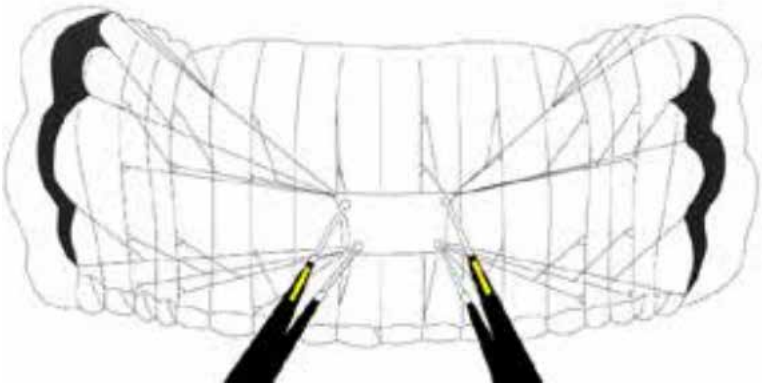
If you don't know if the canopy is flying or not, IT DOES NOT FLY → Perform emergency procedures!

4.1 Flies, fully developed

- Canopy is symmetrical.
- Lines are tense.
- Slider is down.

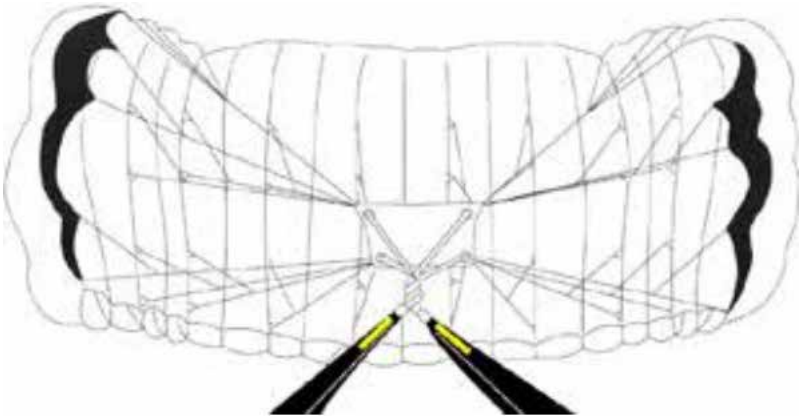
4.2 Flies – Solve

Slider up



- Pump the toggles to get the slider down.
- Maintain altitude awareness.

Slider up and line twists



- Spread the risers, kick the line twists away and pump the slider down.
- Maintain altitude awareness.

Side tunnels are not inflated, and slider is up

- Pump to get the slider down and inflate the tunnels.
- Maintain altitude awareness.

Side tunnels are not inflated, slider is up, and lines are twisted

- Spread the risers, kick the twists away, pump the slider down and inflate the tunnels.
- Maintain altitude awareness.

Opening canopy

- If necessary, pump the toggles to open the canopy.
- Maintain altitude awareness.

4.3 Does not fly

Examples on malfunctions

- Perform emergency procedures.

- Perform emergency procedures.

- Perform emergency procedures.

4.4 Using the reserve canopy

Important altitudes:

600m

- You can try to solve the canopy until 600m altitude. For example, kick line twists, pump to get the slider down and get the side tunnels inflated.
- If you don’t get the canopy solved by 600m, perform the emergency procedures.

300m

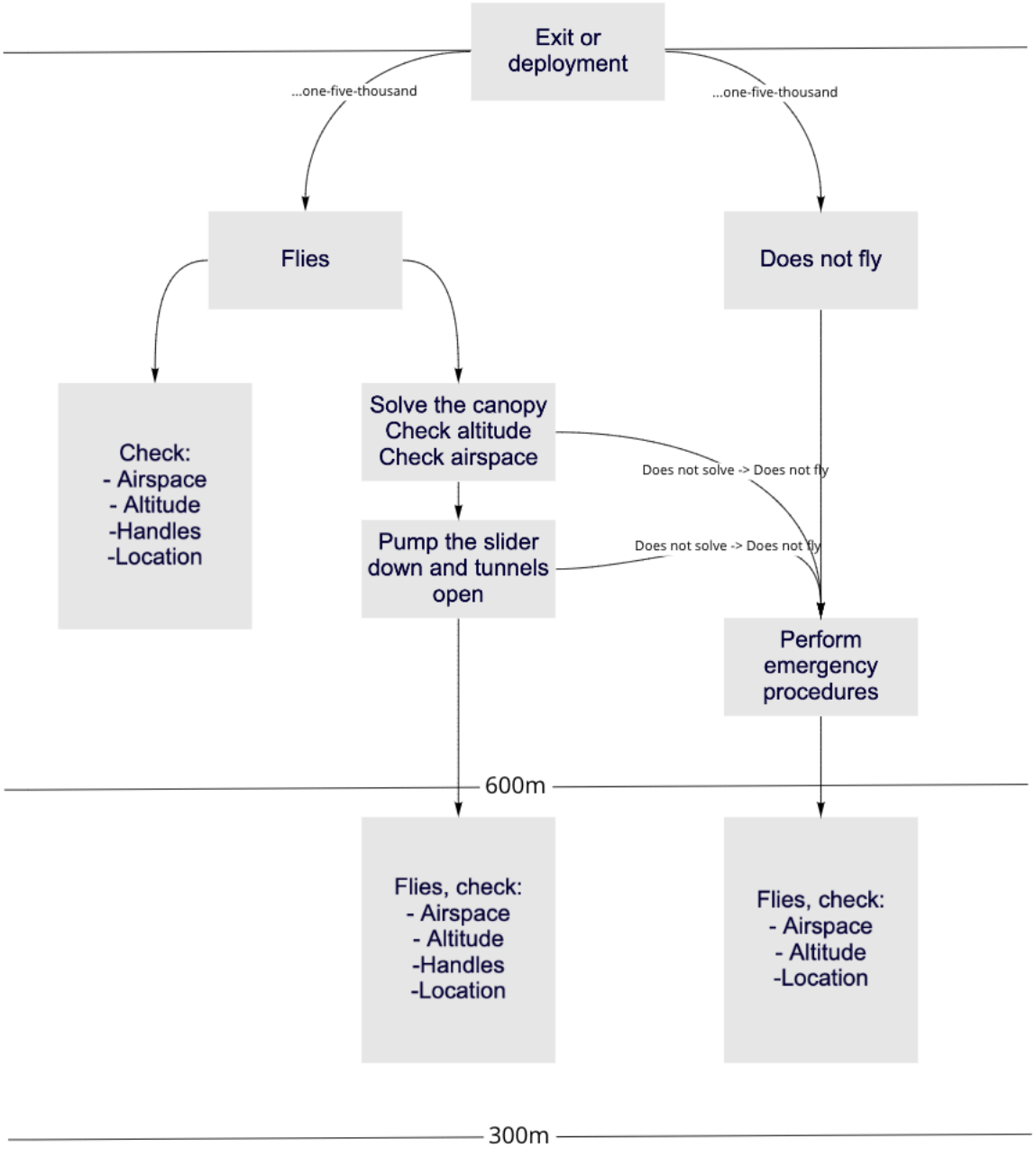
- Below this point it is not allowed to perform the main canopy cutaway (if you for example collide with another canopy), since the reserve canopy might not have enough time to open (exception: downplane situation 5.4). If you find yourself in a situation where you

don’t have a flying canopy below 300m, deploy straight away your reserve canopy without doing a main canopy cutaway (points 6-9 on the next section).

Emergency procedures (EP)

1. Maintain arch.
2. Check altitude.
3. Look at the main canopy cutaway handle (on the right) and grab it with both hands.
4. Peel the velcro and punch your arms straight downwards.
5. Let go of the cutaway handle.
6. Look at the reserve deployment handle (on the left) and grab it with both hands.
7. Peel the velcro and punch your arms straight downwards.
8. Arch.
9. Keep the reserve handle or let go (depending on the club policy).

4.1. Emergency procedures.



4.2. Actions under the canopy after the exit or deployment.

Add your club's instructions here in the event of an Emergency jump and Emergency exit.

5 Possible dangerous situations

5.1 Dangers during the plane and exit

5.1.1 Open container in the plane

Accidental opening of a container (main or reserve) usually happens by a jumper that is not being careful while moving in the plane. Containers or handles might get caught somewhere. Calm and only necessary moving prevent these situations. However, if a container opens in the plane, prevent the canopy from getting out and inform others in the plane by yelling “OPEN CONTAINER!”

Once the door is open it is possible that the container opens, and the canopy gets to the airflow. If the container develops while the door is open it might pull the skydiver out from the plane. In this case it is a real possibility that the skydiver and/or the plane is damaged.

If your container opens at the door and the deployment bag/canopy gets out the door, jump out regardless of the body position. In this situation the instructor helps you get out as fast as possible. If you act quickly, you can save the situation.

5.1.2 Emergency exit

If the pilot needs to lighten the load or the plane is uncontrollable, the pilot or an instructor gives a command “EMERGENCY EXIT!”. With a command “MOVE!” you move towards the door minding the others, with a command “EXIT!” you exit the plane right away. Emergency exit is continued until each jumper in the plane has left, or the pilot or an instructor yell “STOP! EMERGENCY LANDING!” and then, the rest of the jumpers prepare for an emergency landing. Emergency exit policies vary between dropzones and planes.

5.1.3 Emergency landing

During skydive operations the plane usually flies so close to the airport that the plane can glide back to the airport if for example the engine malfunctions. In this situation the pilot or an instructor gives a command “EMERGENCY LANDING!” and in this situation act according to the instructions given by your instructor. Emergency landing policies vary between dropzones and planes.

Once the plane is on the ground and stopped moving, exit the plane right away, since there is a possibility of fire. Help those with possible injuries if possible.

For students, instructions always come from an instructor. The most important thing is to act calmly according to the instructions.

5.1.4 Stuck on the plane

If you are stuck on the plane with your main canopy, you notice it if you are hanging from the plane from your risers. Try to take a good arch so you won't spin, and you can make sure with what you are hanging from the plane. Make sure you are attached only by your risers, then perform the emergency procedures (4.4).

If you are hanging from the plane from the static line system, WAIT until the instructor cuts the line. Only then perform your emergency procedures. REMEMBER that it might take time to cut the static line if it's necessary to get you to a better spot.

5.2 Entanglement with the lines

If your exit or deployment body position is bad, it is possible that you are entangled with the lines. In this situation try to clear yourself from the lines before performing emergency procedures. Use a hook knife if necessary. However, perform emergency procedures (4.4) at latest at 600m altitude.

You can avoid entanglement with the lines by making sure your body position is good when exiting and deploying your parachute.

5.3 Pilot chute problems

Bad body position at the deployment might cause for example the bridle to wrap around your hand. Shake your hand and try to clear yourself from the bridle. If you are not successful on the first try or you are not sure where the bridle is attached, perform the emergency procedures (4.4). If the bridle is wrapped around your arm, you might have to perform the emergency procedures with one hand. With proper exit, deployment and pilot chute throw to the clean air, you can prevent such problems.

During deployment, pilot chute might sometimes come around the nose of the canopy. In this case try steering the canopy, if the canopy does not act normally or makes radical movements, perform the emergency procedures (4.4).

During deployment the pilot chute might get caught to the burble that is forming on top of your back. If you throw the pilot chute and after counting to five-one-thousand you don't feel anything happening, peak over your shoulder. Your body position changes, and the pilot chute should get clean air. If still nothing happens, perform the emergency procedures (4.4) since the bridle might be wrapped around something or the container might be stuck.

You can try to clear entanglement if you are sure where it is. However, if you are not able to clear it with one try or you don't see the problem, perform emergency procedures immediately.

5.4 Problems under the canopy

5.4.1 Two out

Most common reasons for two out -situation are low deployment (during a self-deployed jump) or radical maneuvers under the canopy (such as stalling). In a two out -situation don't fly the landing pattern. If you have already opened the brakes for one canopy, keep the speed of the canopies similar by applying sufficient brakes.

Biplane

Carefully steer a leading canopy by making only necessary adjustments from the rear risers. Do not open the brakes. Do not flare and prepare for the PLF.

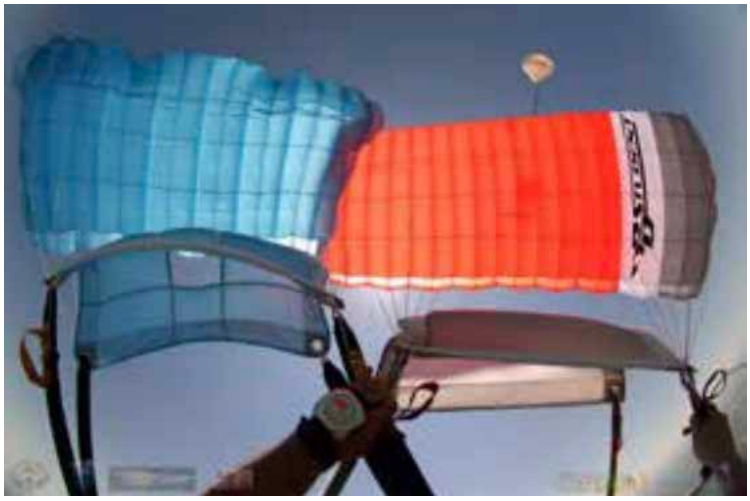
Do not cut away the main!

5.1. Biplane.

Side-by-side

Carefully steer the leading canopy (=the one that is more on top of your head) by making only necessary adjustments from the rear risers. Do not open the brakes. Do not flare and prepare for the PLF.

Do not cut away the main!



5.2. Side-by-Side.

Downplane

This situation is rare. Canopies might change to a side-by-side -situation.

Cut away the main!

5.3. Downplane.

5.4.2 Canopy collision

Collision is always a possibility when there are multiple jumpers at the same time. Immediately after you have checked the canopy, check the airspace and be prepared to dodge others. Before opening the brakes you can steer by using the rear risers (as long as there are no line twists). Dodge to the **right**!

Always look towards the turn to make sure there is no one there. Jumper with a lower altitude has the right of passage. If you can't avoid the collision, minimize the speed by applying full brakes and curl to the ball position. Yell to the other jumper to get their attention before the collision.

In case of a canopy wrap:

- Maintain altitude awareness since you have to make the decisions high enough.
- Discuss with the other jumper what you are going to do.
- Make sure you are clear from the lines / canopy (if necessary, use the hook knife) before performing the emergency procedures.

If the upper canopy flies and the lower one is entangled, the lower one can perform the emergency procedures and the upper one can usually land with their main. If canopies are wrapped together, probably both jumpers need to perform the emergency procedures, in this case discuss with the other jumper about the order in order to avoid collision under the reserve canopies. If the altitude is too low to cut away (below 300m), can two jumpers land with one canopy.

Keep in mind in any decisions the loss of time and altitude.

5.5 Off landings

You can usually prevent off landings by steering correctly. At the beginning it might be hard to evaluate the altitude versus the distance travelled. Once you gain more experience it gets a lot easier. Sometimes even the exit spot might be wrong especially when the wind changes suddenly. Nevertheless the reason, if you make the decision and plan for an off landing early enough helps you to make a safe landing. Plan changes at the last minute are dangerous!

Good places for an off landing are fields and other open spaces. Regardless the place, try to land to a headwind! Most important thing is not to make turns at a low altitude. Take a good body position for landing and keep it until you are on the ground.

If you have to make an off landing, you might not be able to see the windsock. Even before boarding the plane make a mental note where for example sun is in relation to the wind. Flags and smoke are also really good wind indicators.

5.5.1 Water landing

Pick a forest over water. If you have no choice try to land as close as possible to the shore. Follow these instructions during a water landing:

- Open the reserve static line (RSL).
- Turn the FXC (if you have one) to OFF.
- Prepare for PLF.
- Flare before hitting the water.

In the water:

- Make sure RSL is disconnected.
- Cut away the main parachute using the cut away handle.
- Swim towards the ground and use the harness as a floating device as long as it helps you (around 2–3 min).
- Loosen the straps and swim away from the harness as soon as it doesn’t float anymore.

5.5.2 Landing in trees / forest

If landing in trees or a forest, follow these instructions:

- Avoid individual tall trees.
- Take a landing body position and lift your knees to protect the lower body.

- Flare to the top of the trees and keep your elbows tightly against your body.
- Prepare to go all the way to the ground and maintain the body position until the movement has stopped completely.

If you are hanging from a tree, do not jump or release yourself, grab the tree and wait for help.

When landing in trees, horizontal speed is a greater risk than a vertical speed. Flaring at the treetop level is safer than flying to a tree.

5.5.3 Power lines

If you have no other options and you land to a power line, follow these instructions:

- If you have any handles in your hands, drop them.
- Steer the canopy until the end.
- Take a landing body position and flare to the lines.
- Prevent the lines from going between your legs or to your armpits.
- If the canopy is wrapped around the lines, do not try to free it.
- Wait for help.

5.5.4 Landing on a roof

If you have to land on a roof, follow these instructions:

- Prepare for PLF.
- Flare to the roof.
- Collapse the canopy right away and cut it away if necessary.
- Take a grab from the roof.
- Wait for help.

5.5.5 Collision with a solid object

If you collide with a solid object such as wall, car, pole and fence, follow these instructions:

- Flare before the collision.
- Take the hit with your legs.
- Prepare for PLF.

Proper PLF is an essential skill if you have to land off from the landing area.

6a AFF Jumps

During an AFF course you will receive personal training. AFF is formed by eight different levels. Each level includes at least one AFF instructor with you on the jump. On a level eight, the instructor follows your performance from the plane. During the training you will advance at your own pace. On each jump you will utilize the skills you gained from the previous levels, so each level needs to be passed before advancing to the next level.

Students need to achieve minimum learning requirements to advance to the next level. If there has been time from the preparation for the first jump and the jump was never done, ground preparation needs to be repeated.

6a.1 Freefall during AFF-jumps

During the exit, arch from the pelvis, move arms and legs to the correct position and keep your eyes to the plane as long as possible. Try to relax by breathing out through your mouth and keep your chin up. Imagine that you're pushing your pelvis through the air.

6a.1.1 Circle Of Awareness (COA)

After the exit counting start the circle of awareness by yourself:

1. **Heading**
   - Move your eyes to the horizon. Pick a point from the horizon for a reference.

2. **Altimeter**
   - Maintain a good arch and move your eyes to your altimeter and read the altitude (3.5.1).

3. **Altitude** (Reserve side instructor)
   - Look under your left arm to the reserve side instructor and yell the altitude. Instructor can at this point correct your body position by hand signals (attachment 5). If there are no necessary corrections, you'll receive a "OK" hand signal (thumbs up). Do not continue the circle of awareness until you've received a "OK" signal.

4. **Altitude** (Main side instructor)
   - Look under your right arm to the main side instructor and repeat the same drill to the main side instructor. If everything is okay, you'll receive a "OK" signal. Do not continue until you have received a "OK".

With a circle of awareness you'll maintain your sense of altitude and direction.

6a.1.2 Practice pull

Start by yourself, but if you also see the practice pull -hand signal, it is a signal for you to start doing practice pulls. Maintain a good rhythm and say actions out loud.

1. **Arch**
   - Push your pelvis downwards.
   - Maintain the arch and keep your chin up throughout the pull.

2. **Reach**
   - Keep your chin up. Move your left hand to the same level than your forehead in a way you can see your thumb. Move your right hand to the deployment handle with an open palm. Hand movement should be symmetrical, same level and simultaneous. Only arms move, head or the rest of the body does not move.
   - Touch the handle with your palm and remember the location. It is important to feel clearly where it is.

3. **Pull**
   - Return the arms to starting positions symmetrically and simultaneously. Only arms move, head or the rest of the body does not move.

6a.1.3 Deployment

On your first jump you'll start the deployment at 1600m altitude. First show the deployment signal so you'll inform others that you are about to deploy by waving your arms across in front of your head. After the deployment signal start the deployment sequence calmly and precisely. Deployment is done the same way than the practice pull. Only exception is that you'll take a good grip from the deployment handle and throw the pilot chute hard to the airflow. This means that the canopy does not need to be flying at 1600m.

ARCH – REACH – PULL

After this count out loud one-one-thousand, two-one-thousand….five-one-thousand, and then check your canopy and if necessary solve it. If the canopy does not fly or you're unable to solve it, perform the emergency procedures. During the levels 1–2 the reserve side instructor is holding on to you until the canopy is deployed and during the levels 3–7 an instructor makes sure the deployment happens.

6a.2 Level 1 – Getting familiar with the freefall

Two instructors, radio on the three first jumps.

If you see only one instructor, follow instructions given by that instructor and continue the jump according to the jump plan. During levels 1 and 2 you are not allowed to be alone in the freefall. If you can't see either of the instructors, deploy immediately, ARCH–REACH–PULL 1-1000, 2-1000…5-1000 and check the canopy.

6a.2.1 Actions by the student

Practice the flow of the dive as well as possible before the jump. It will help and advance your learning.

6a.2.2 Preparing for the first jump

1. Show how you move to the door and take the exit position.

2. Show a proper exit including the exit count.

3. Go through and practice the planned dive flow part by part.

4. Practice the practice pull the same way than the actual deployment.

   ARCH –- Maintain good arch, look forward to the horizon and keep your chin up.

   REACH – Maintain arch while you simultaneously move your right hand with an open palm to the deployment handle and left arm forward in front of your head. Make a mental note where the handle is. Arms are on the same level and only arms move, the rest of the body and head stays at the same position. Keep your chin up and look to the horizon.

   PULL – Return your arms to the starting point simultaneously and symmetrically. Look to the horizon and keep your chin up. Only arms move, the rest of the body and the head stays put. Keep in mind this is just a practice pull, do not actually deploy.

5. Practice the dangerous situations that might occur during flight and jump.

6. Check the ground wind and imagine the correct landing pattern.

7. Show a correct landing body position and PLF.

8. Repeat the hand signal training.

6a.2.3 Learning objectives

Each level has their own learning objectives and your jump and advancement decision is evaluated based on them. Go through the learning objectives with your instructor.

1. Stable freefall body position 10 seconds before deployment altitude.
2. Altitude awareness.
3. Deployment sequence started at 1600m (±300m) and independent deployment.

6a.2.4 During the flight

- Look at the landing area over 600m altitude and the right direction for landing. Instructor asks the important altitudes from you during the flight.
- Go through the jump with the instructor.

6a.2.5 Dive flow

- 3000–4000m Relaxed exit with good arch.
- Circle of awareness.
- 3 Practice pulls.
- Circle of awareness.
- Altitude awareness.
- 1600m Deployment sequence and deployment.

6a.3 Level 2 – Body control

Two instructors, radio on the three first jumps. Students have to meet essential learning objectives to advance to the next level.

6a.3.1 Actions by the student

1. Go through the skills learned on the level 1.
2. Practice the stable freefall body position on for example a board.
3. Practice all objectives done in freefall just like on any other jump.
4. Do the practice pull just like you would do the actual deployment.
5. Show the landing area and go through the planned landing pattern.
6. Use mental training to prepare for the jump.
7. Be more active while putting on the gear and checking the gear.
8. More independent and safe steering under the canopy.

6a.3.2 Learning objectives

1. Stable freefall body position within 10 seconds after the exit.
2. Maintaining stable freefall body position throughout the jump.
3. Deployment sequence started at 1600m (±300m) and independent deployment.

6a.3.3 During the flight

1. Go through all learned skills during the flight.
2. Use a relaxing breathing technique (breathe slowly in, hold for a while and relax while breathing out).
3. Show some landmarks and tell the instructor when you are at the deployment altitude.

6a.3.4 Dive flow

- 3000–4000m Relaxed exit with good arch
- Circle of awareness
- Practice pulls until OK
- Heading, altimeter, arch, legs, relax
- Movement forward
- Heading, altimeter, arch, legs, relax

- 90 degree turn to the left
- Heading, altimeter, arch, legs, relax
- 90 degree turn to the right
- Heading, altimeter, arch, legs, relax
- 1600m Deployment sequence and deployment

6a.4 Level 3 – Stable freefall

Two instructors, radio on the three first jumps.

If during levels 3–7 you don't see an instructor(s), you can continue with the jump if the following criteria is met:

- You are aware of your altitude.
- You are not spinning.
- You are not on your back.
- Overall situation is under control.

Maintain altitude awareness, check your altimeter every five seconds (HEADING, ALTIMETER, ARCH, LEGS, RELAX) and show the deployment signal at the right altitude and deploy your parachute normally. Do not do any other exercises.

If you cannot find the deployment handle, try once again, but if you are still unsuccessful, perform the emergency procedures.

If you have difficulties to pull the deployment handle (hard pull), try once again, but if you are still unsuccessful, perform the emergency procedures.

6a.4.1 Actions by the student

1. Explain and present skills learned from the previous levels.
2. Practice spotting with an instructor.
3. Practice the roll over technique.
4. Present the technique to maintain heading while in freefall.
5. Concentrate and relax. Use mental training to practice a good freefall body position and practice it.
6. Go through the jump flow and practice it.

6a.4.2 Learning objectives

1. Spotting before the exit.
2. Stable and independent freefall within 5 seconds after exit.
3. Preventing and stopping unintentional turns.
4. Deployment sequence at 1600m (±150m), stable and independent deployment without assistance from the instructor.
5. Independent and safe canopy flight.

6a.4.3 During the light

1. Repeat already learned actions in the plane.
2. Use relaxing breathing and positive mental pictures.
3. Look at the airport and airspace with the instructor before the exit.

6a.4.4 Canopy flight and landing

1. Perform the same way than you did on the previous jumps, except try to do everything with more focus.
2. You can try stand up landing (but always maintain a proper landing body position).

6a.4.5 Dive flow

- 3000–4000m relaxed exit with a proper arch.
- Circle of awareness.
- Practice pulls until OK.
- Stable and independent freefall.
    - HEADING
    - ALTIMETER
    - ARCH
    - LEGS
    - RELAX
- 1600m deployment sequence and deployment.

6a.5 Level 4 – 90 degree turns

One instructor.

Student have to achieve necessary learning objectives to advance to the next level.

6a.5.1 Actions by student

1. You can show and perform a gear check during gearing up and before boarding the plane (2.6).
2. Practice entire dive flow.
3. Spot the airspace and clouds before the exit and notice sufficient exit separation between you and the previous group.
4. Check your gear before the exit (2.6).

6a.5.2 Learning objectives

1. Spotting the airspace and clouds and a proper exit separation between groups.
2. Checking your own gear (while gearing up and before boarding the plane).
3. Stable freefall body position.
4. At least 2 controlled 90 degree turns (±20 degrees) (10.2).

5. Deployment sequence and deployment at 1500m (±150m), stable and independent deployment.

6a.5.3 During flight

1. Repeat already learned actions in the plane.
2. Check your gear before exit.
3. Spot the airspace and clouds and keep enough exit separation to the previous group.

6a.5.4 Canopy flight and landing

1. Act according to the previously learned skills.
2. Try to land within 50 meters from the planned spot with minimal assistance.

6a.5.5 Dive flow

- 3000–4000m Relaxed exit with a proper arch.
- Circle of awareness (instructor moves in front of the student).
- Ask for permission to turn (student nods to the instructor, instructor replies with a nod).
- 90 degrees to the left.
    - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 90 degrees to the right.
    - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 2000m no more turns.
    - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 1500m deployment sequence and deployment.

6a.6 Level 5 – 360 degree turns

One instructor.

Student have to achieve necessary learning objectives to advance to the next level.

6a.6.1 Actions by the student

1. Show that you can perform a gear check and adjust your gear.
2. Practice the dive flow.
3. Spot the airspace, clouds and keep a proper exit separation to the previous group.
4. Automatically perform a gear check before the exit (2.6).

6a.6.2 Learning objectives

1. At least two controlled 360 degree turns (±45 degrees) (10.2).
2. Even more stable freefall.
3. Deployment sequence at 1500m (±150m). Stable and on heading deployment without assistance.

4. Perform 90 degree turns under the canopy from the rear risers before and after opening the brakes.

6a.6.3 During the flight

1. Perform a gear check by yourself before the exit.
2. Spot the airspace, clouds and keep a proper exit separation to the previous group.

6a.6.4 Canopy flight and landing

1. Do 90 degree turns under the canopy from the rear risers before and after opening the brakes.
2. Try to land within 50m from the planned spot.
3. Remember a proper approach and landing technique.

6a.6.5 Dive flow

- 3000–4000m Relaxed exit with a proper arch.
- Circle of awareness (instructor moves in front of the student).
- Ask for permission to turn (student nods to the instructor, instructor replies with a nod).
- 360 degrees to the left.
    - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 360 degrees to the right.
    - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 2000m no more turns.
    - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 1500m deployment sequence and deployment.

6a.7 Level 6 – Unlinked exit

One instructor.

Student have to achieve necessary learning objectives to advance to the next level.

6a.7.1 Actions by the student

1. Repeat already learned things.
2. Practice floating exit body position and technique (9.2.3).
3. Practice barrel roll technique and stabilizing (10.5).
4. Practice backflip technique and stabilizing (10.6).

6a.7.2 Learning objectives

1. Independent exit without assistance.
2. Stabilizing body position within five seconds.
3. Deployment sequence 1400m (±150m) and deployment.
4. Proper approach and landing pattern.

6a.7.3 During the flight

1. Repeat actions from the previous levels.
2. Check your gear before exit.
3. Spotting the airspace, clouds and keep a proper exit separation.
4. Perform stable floating exit without assistance.

6a.7.4 Canopy flight and landing

- Do a proper approach and landing pattern.

6a.7.5 Dive flow

- 3000–4000m Floating exit.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- Barrel roll.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- Backflip.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 2000m Locate the airport and focus on the deployment.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- Deployment sequence and deployment.

6a.8 Level 7 – Half series

One instructor.

This is your last level where an instructor jumps with you. During this level you should be able to work as independently as possible and show that you are able to control safety related things during skydiving, such as stable freefall, deployment and canopy flight.

6a.8.1 Actions by the student

1. Practice diving exit body position and technique (9.3).
2. Practice frontflip technique (10.4).
3. Practice backflip technique (10.6).
4. Practice turning technique (10.2).

6a.8.2 Learning objectives

1. Spot the airspace, clouds and a proper exit separation.
2. Diving exit and stable freefall within five seconds.
3. Stabilizing freefall position during the maneuvers within five seconds.
4. Deployment sequence 1400m (±150m) and deployment.
5. Safe canopy control.

6a.8.3 During the flight

1. Check your gear before the exit.
2. Spot the airspace, clouds and keep a proper exit separation to the previous group.

6a.8.4 Canopy flight and landing

1. Show how you control your canopy safely.

6a.8.5 Dive flow

- 3000–4000m Diving exit.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- Frontflip.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- Backflip.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 360 degrees left/right.
- 2000m locate the airport and focus on the deployment.
  - HEADING, ALTIMETER, ARCH, LEGS, RELAX
- 1400m deployment sequence and deployment.

6a.9 Level 8 – 15” short freefall

One instructor in the plane.

This is your last jump of the first jump course and your first jump from lower altitude. Instructor does not jump with you.

Also read *10.8 Dangerous situations.*

Ask from your instructor how this affects the emergency exit procedures.

6a.9.1 Actions by the student

Repeat already learnt things: Unlinked floating exit, body position stabilizing, altitude awareness and stable deployment.

6a.9.2 Learning objectives

1. Exit spot, airspace, clouds and keep a proper exit separation.
2. Floating exit.
3. 15” freefall and constant altitude awareness.
4. Deployment sequence at 1400m and deployment.

6a.9.3 During the flight

1. Check your own gear.
2. Check the spot, airspace, clouds and keep a proper exit separation.

6a.9.4 Canopy flight and landing

1. Show how you control your canopy safely.

6a.9.5 Dive flow

- 1800–2500m Floating exit.
- Altimeter.
- 1400m Deployment signal and deployment.

6b Static line first jump course jumps

6b.1 Static line

Your first jumps are static line jumps. Once you exit the plane a static line system opens the container and pulls out the deployment bag, then the lines start to release from the rubber bands, canopy comes out from the deployment bag and starts to develop from the middle, slider slides down the lines while slowing down the deployment. Your job is to check the canopy and if necessary, solve it.

6b.1.1 Actions by the student

Exit body position needs to be symmetrical X-position or a delta-position (depending on a plane type). You need to have a good arch and maintain that body position until the parachute is deployed. There won't be freefall on your first jumps, but your body position still affects how successful your jump is.

6b.1.2 Preparing for your first jump

This chapter is recap from the chapter *3.1 Preparing for the jump*.

Skydive does not begin when you leave the plane. To have a successful jump it is important to focus on preparing well. Decision to jump should be made already on the previous day, this way you have time to prepare mentally for the jump. Sufficient amount of sleep and food is essential, since focusing is much harder when you are tired or hungry. There are some tips for mental preparing in attachment 4.

Before adding yourself to the manifest you should gather all your gear and then you are added to the load. Gear should be tested and required adjustments done with enough time to do them properly. Jump should be practiced alone or with your instructor.

If it is possible to follow other jumpers before your load, you can see the upper winds and their effect on canopies so you can prepare mentally on your own jump and work with the winds.

Before boarding the plane instructor makes a gear check, and after that do not adjust your gear without permission from your instructor! Instructor goes through the current landing pattern according to current winds before walking up to the plane. Students walk up to the plane only with an instructor. Approach the plane only from behind.

6b.1.3 Learning objectives

Jump is judged by the following criteria.

1. Keep the chest presented to the relative wind during exit.
2. Keep a stable and symmetrical exit body position.
3. Time awareness by counting.

4. You see the plane or the instructor.

6b.1.4 During the flight

This chapter is a recap from the chapter *3.1.1 In the plane*.

Usually, the plane is loaded in a reversed order, meaning that the one who is boarding the plane first, jumps last (instructor is an exception). Boarding has different rules on different clubs, and they are told to you before your jump. Always follow the instructions given by the instructor. Maintaining the balance of the plane is extremely important for safety, if the weight balance is wrong, the plane might stall and stop flying.

Protect your gear in the plane so nothing gets entangled on anything. Be especially careful with the deployment handles when you or someone else is moving around. If you feel that something is stuck, do not pull yourself free with force, notify your instructor. Avoid unnecessary movement in the plane. If the plane has seat belts, keep them attached until the instructor gives you permission to open them. If you notice anything wrong during the flight with the plane, your or someone's gear, notify your instructor right away.

Focus on your own jump. Mind others and do not bother while they are trying to focus on their own jump. Pilot is the chief of the plane, but your chief is your instructor. When approaching the jumprun the plane flies a line according to current winds. Instructor checks your gear well before the exit.

6b.1.5 Dive flow

Instructor checks your gear before opening the door. Once the plane is approaching the planned exit spot the door is opened.

You will receive a command "**DOOR**" and "**GO**", when you act just like practiced. After the exit start counting the deployment.

One-one-thousand

- Maintain X-position and arch or take a delta-position and arch (legs almost completely straight).

Two-one-thousand ... Four-one-thousand

- Maintain arch and body position
- Canopy is deployed. Check it and solve if necessary.

Five-one-thousand

- Check over your shoulder if necessary.

After the canopy is deployed, decide if the canopy **FLIES** / **DOES NOT FLY** and airspace, altitude, handles and location and start planning your landing.

6b.1.6 Exit / Cessna 206

This chapter is a recap from the chapter *3.2 Exit Cessna 206, SL*.

Instructor calls "**DOOR**!", you move carefully to the door and take the exit position. Instructor calls "**GO**!" you launch from the plane, arch well, take the delta position and start counting.

Your shoulders should stay in line with the line of flight. During the exit it is easy to accidentally start looking to the ground. If you are looking to the ground instead of the plane, your arch easily turns to the wrong direction. Human body usually turns towards where you are looking at, so when during the exit you look up to the plane, your body usually automatically arch the correct way. Arching starts from the pelvis (also neck and back).

Arching is the most important part of exit. In delta position your arms are about 45 degrees from your body to the sides and shoulders back. Legs are kept in shoulder width and only slightly bent.

Counting is important to learn early on. Practically it is the only way to keep your sense of time during this phase of training. Counting happens out loud (one-one-thousand, two-one-thousand …. five-one-thousand). During the exit practicing you practice the correct rhythm and not just count numbers. In the air a couple of seconds can feel like a long time.

6b.1.7 Exit / Cessna 182 (strut plane)

This chapter is a recap from the chapter *3.3 Exit, strut plane (SL)*.

When the instructor gives a command "**DOOR**!", move to the door. Command "**GO**!" gives you permission to go hanging from the strut and take a good exit position and then let go while maintaining good arch and X -position and start counting.

Your chest should stay oriented towards the direction of the plane.

While exiting the plane, ground is usually pulling your sight towards it. If you look down to the ground instead of the plane, the arch will most likely turn the wrong way. If you look to the plane while exiting, it helps you to maintain a good arch. Arch starts from the pelvis (also back and neck).

If your arch disappears suddenly, it is easily fixed: by arching.

Most important thing while exiting is arching. In X -position your arms are held high and wide, shoulders bent back. Your legs should be spread about shoulder width apart and only slightly bent.

Counting is important to start early on, since it is the only way to keep your sense of time at this point of training. Counting should be yelled out loud (one-one-thousand, two-one-thousand). While exit practices, you are practicing a correct rhythm, so you are not counting just numbers, you are counting seconds. While skydiving, only a couple of seconds might seem a long time.

6b.2 Practice pull

Goal of a practice pull is to learn self-deployment by counting in a way that the body position before, during and after the deployment stays stable.

During practice pull jumps the parachute deploys faster than on a self-deployed jump because of the static line system. Practice pull is the only way to learn necessary things for self-deployment. Even though the parachute is deployed, the whole movement is done completely just like practiced. To be able to enter the practice pull jumps, you need to complete three stable static line jumps. During the jump you need to see either the plane or the instructor while exiting. Also, you need to remember your exit and body position. You can start jumping practice pulls after theory-, ground- and harness training.

6b.2.1 Learning objectives

1. Chest presented to the relative wind during exit.
2. Stable and symmetrical body position.
3. Arms are moving symmetrically during deployment sequence.
4. Practice handle is pulled within 2–4 seconds after exit.
5. Start counting.

6b.2.2 During the flight

Act just like you have until this point, check the *3.1.1* for recap.

6b.2.3 Dive flow

6b.1. Symmetrical deployment X-, delta- and basic body positions.

ARCH (one-one-thousand)

- Take either a X-position and arch or delta and arch (legs almost completely straight).

REACH (two-one-thousand)

- Left hand on top of your helmet as a natural extension of your body and right hand to the main deployment handle with a firm grip.

PULL (three-one-thousand)

- Pull the handle to the direction of the housing or a pocket.
- Return to X-position or delta position.

One-one-thousand

- Start counting from the top after the pull.
- Maintain symmetrical body position through the deployment.

Two-one-thousand … Four-one-thousand

- Parachute is deployed, check it and if necessary, solve it.

Five-one-thousand

- If necessary, check over your shoulder.

After the parachute flies, put the practice deployment handle somewhere safe away from your hand (under the jumpsuit or on your chest strap). If the parachute does not fly, drop the practice deployment handle and perform the emergency procedures.

6b.2.4 Dangerous situations

Unstable body position: Arm(s) or leg(s) pulled in → body position falls on your side / on your back → possibility to entangle with the opening parachute.

6b.2.5 Practice

1. Practice the jump with following instructions:
   - On the ground with movement exercise.
   - On the ground with your gear on.
   - In a practice harness emergency procedures included.
2. Show successful practice pull on the ground to your instructor.

6b.3 3” Self-deploy

Self-deployed jumps are meant to teach you how to deploy your parachute by yourself. On top of that they teach you the basics of a freefall, remove the turbulence and you need to understand how the self-deployed parachute deployment system works. You also need to review emergency procedures (4.4) and actions if you are entangled with the bridle (5.3) or a riser (5.2) Also read *3.5 Freefall basics* and *3.6 Deployment*. **Ask from your instructor how the emergency exit procedures are changed.**

To get to the self-deployed jumps you need to have at least six static line jumps with three of them were practice pulls. Theory-, ground and harness training is done before moving to self-deployed jumps. Last passed practice pull and first self-deployed jump is done either on the same, or the next day.

During self-deployed jump it is important to maintain good body position (X-position and arch or delta and arch), time and altitude awareness throughout all self-deployed jumps.

6b.3.1 Learning objectives

1. Maintain stable body position before and during deployment.
2. Deploy the parachute around 3 seconds after the exit.
3. Return to symmetrical body position after the pull.
4. Maintain symmetrical body position through the deployment.
5. Start counting.

6b.3.2 During the flight

Same procedures than earlier, remember to protect your deployment handle.

6b.3.3 Dive flow

ARCH (One-one-thousand)

- X-position and arch or delta and arch (legs almost completely straight).

REACH (Two-one-thousand)

- Left hand on top of your helmet as a natural extension of your body and right hand to the deployment handle with a firm grip.

PULL (Three-one-thousand)

- Pull to the direction of the housing or a pocket.

One-one-thousand

- Start counting from the top after the pull.
- Maintain symmetrical body position through the deployment.

Two-one-thousand ... Four-one-thousand

- Parachute deployed, check it and if necessary solve it.

Five-one-thousand

- If necessary, check over your shoulder (removing the turbulence).

If the parachute flies, put the deployment handle away from your hand (under the jumpsuit or to the chest strap). If the parachute does not fly, drop the handle and perform the emergency procedures.

6b.4 5” Self-deploy

This is your second self-deployed jump. Release your grip from the strut or launch from the plane, count one-one-thousand – two-one-thousand – arch – reach – pull. Maintain still good body position even after the pull. Time awareness should be better.

6b.4.1 Learning objectives

1. Maintain stable body position before and after the pull and return to symmetrical body position after the pull.
2. Start the deployment sequence 4–7 seconds after the exit and deploy your parachute.

6b.4.2 During the flight

- Go through the jump in your mind.
- Focus on your jump.
- 3x3 check before the exit (2.6).

6b.4.3 Dive flow

ARCH

- Exit the plane and take a good arch right after you leave the plane.

One-one-thousand

- Maintain time awareness by counting.

Two-one-thousand

- Make sure the arch and body position is good.

ARCH (Three-one-thousand)

- Maintain body position and arch.

REACH (Four-one-thousand)

- Left hand on top of your helmet as a natural extension of your body, right hand on the main deployment handle with a firm grip.

PULL (Five-one-thousand)

- Pull the handle to the direction of the housing or the pocket.
- Return to X-position or delta.

One-one-thousand

- Start counting from the top after the pull.
- Maintain symmetrical body position through the deployment.

Two-one-thousand ... Four-one-thousand

- Parachute is deployed, check it and if necessary, solve it.

Five-one-thousand

- Check over your shoulder if necessary (remove the turbulence).

If the parachute flies, put the deployment handle away from your hand (under the jumpsuit or chest strap). If the parachute does not fly, drop the handle and perform the emergency procedures.

6b.5 10”

This is your first jump where you reach terminal speed in the freefall. Correct, stable and symmetrical body position makes sure it goes well.

Read chapter *10.8 Dangerous situations*

Start the deployment sequence at 1300m according to the altimeter. Counting helps you maintain time awareness.

6b.5.1 Learning objectives

1. Maintain good body position before, during and after the deployment.
2. Read your altimeter and start your deployment sequence at correct altitude.
3. Transfer from exit body position to basic freefall body position (10.1).

6b.5.2 During the flight

1. Mental training.
2. Focus on your jump.
3. 3x3 check before the exit (2.6).

6b.5.3 Dive flow

ARCH

- Perform the exit and take a good arch once you are in the airflow.

One-one-thousand ... Six-one-thousand

- Maintain time awareness by counting.
- Transition to basic body position (10.1).
- Check your altimeter throughout the jump.

Seven-one-thousand

- Freefall speed is at terminal speed. Relax your body.

1300m

- Start deployment sequence. **ARCH**.
- Make sure you have a good arch and body position.

REACH

- Left hand on top of your helmet as a natural extension of your body. Right hand on top of the main deployment handle with a firm grip.

PULL

- Pull the handle to the direction of the housing or a pocket.
- Return to the basic body position (10.1).

One-one-thousand

- Start counting from the top after the pull.
- Maintain symmetrical body position through the deployment.

Two-one-thousand ... Four-one-thousand

- Parachute is deployed, check it and if necessary solve it.

Five-one-thousand

- Check over your shoulder if necessary (remove the turbulence).

If the parachute flies, put the deployment handle away from your hand (under a jumpsuit or chest strap). If the parachute does not fly, drop the handle and perform emergency procedures.

7 Packing a student parachute

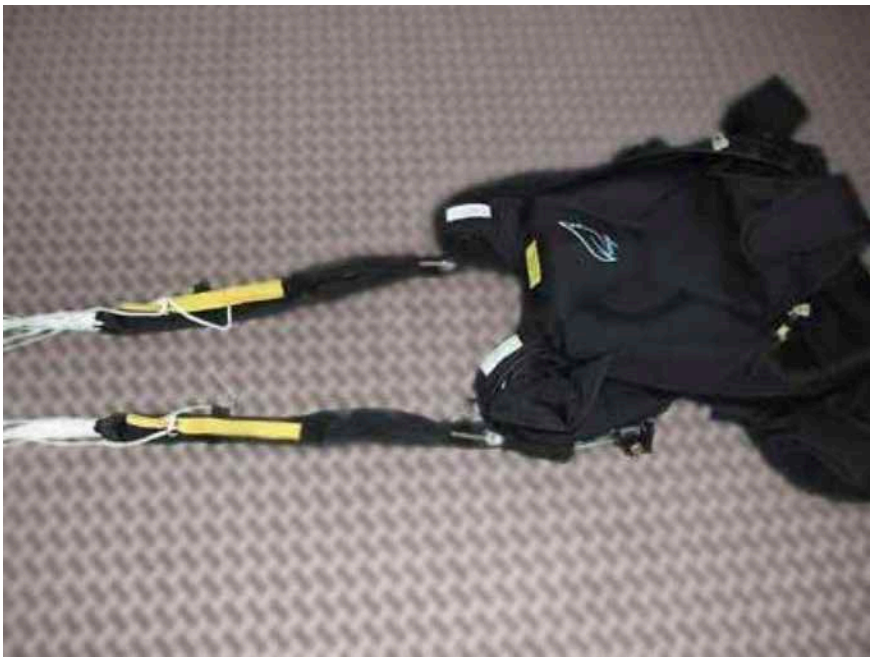
7.1 Overall

If there are differences between this guide and manufacturer guide, manufacturer guide is always a priority!

This packing guide is an overall guide. Each club has their own gear and possible adjustments or add-ons made to the gear according to the needs of the club. Most of the main parachutes can be packed the same way until the closing of the harness. Different manufacturer standards and static line systems causes differences in closing the harness. Check the closing guidance from your local club! **So each club must follow their own instructions!**

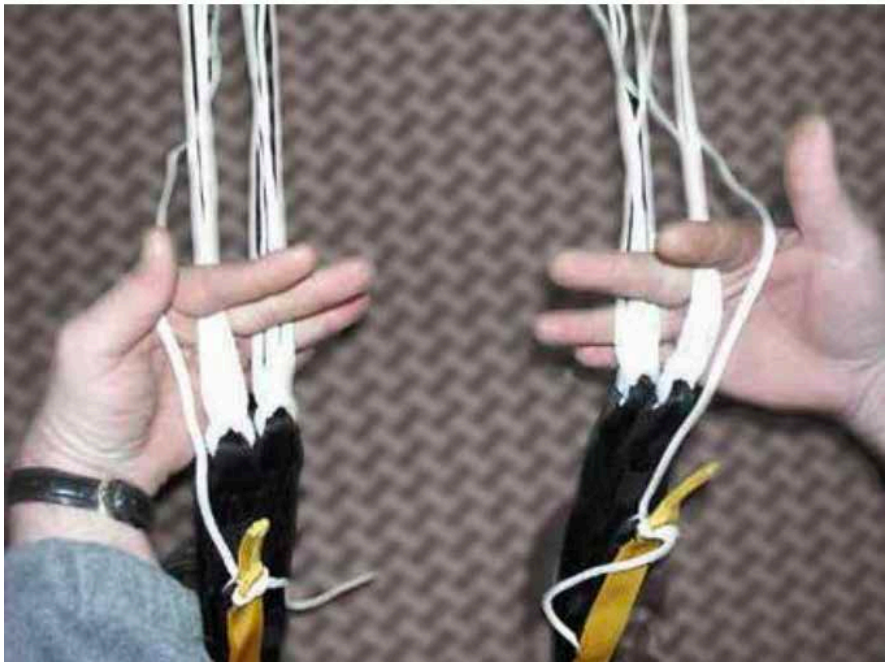
7.2 Packing the main parachute until the first checkpoint

Return all other gear to their designated places after the jump before you start to pack. This way others can use them and they're safe. Prior to packing it is also important to solve and clean the parachute and harness. If you notice anything weird or broken before or during packing, inform your instructor or rigger right away. Broken or wet parachute should not be packed! Parachute is packed on a dry and clean spot. Start the packing paperwork already before packing. When parachute is packed correctly, it will deploy well and it makes the lifecycle longer.



7.1

- Set the harness on top of the packing mat backside to the ground, risers on the ground and the same level than harness.
- Solve and clean the harness and place the packing weight. Place the pull-up cord through the closing loop.
- Pull the slider down to the risers and make sure it's straight.
- Clean the canopy and place it on the ground nose down.



7.2

- Take left risers to the left hand and right risers to the right hand.
- Walk through the lines fingers through the lines. Remove possible twists from the steering lines.
- Check the deployment bag and replace broken rubber bands. Remove twists from the bridle.
- Clean and check the pilot chute.

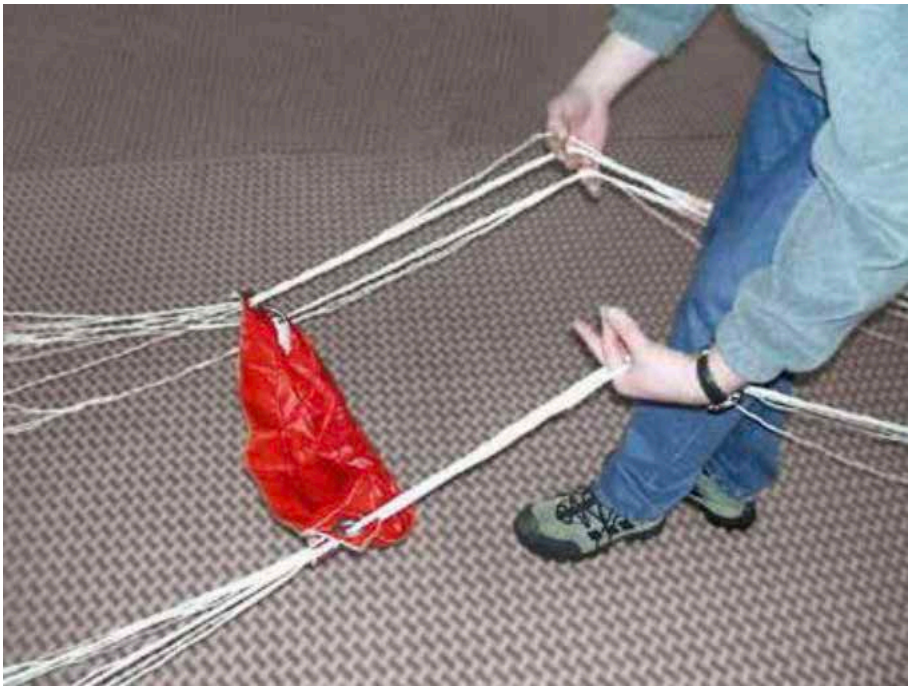
7.3

- Set the brakes. Stow the excess line to the holding system on the riser (depends on the manufacturer).

Move between the risers and take the lines to your hands.

7.4

- Steering lines between index fingers and thumbs.
- Lines connected to the rear risers between index fingers and middle fingers.
- Lines connected to the front risers between middle fingers and ring fingers.



7.5

- Walk the slider up all the way to the canopy.

7.6

- Check that steering lines are clear from all the rest of the lines (=canopy is clear).
- Shake the canopy sideways to clear the flakes.

7.7

- Move all lines to one hand and lift them up to one shoulder while maintaining tension on the lines.

7.8

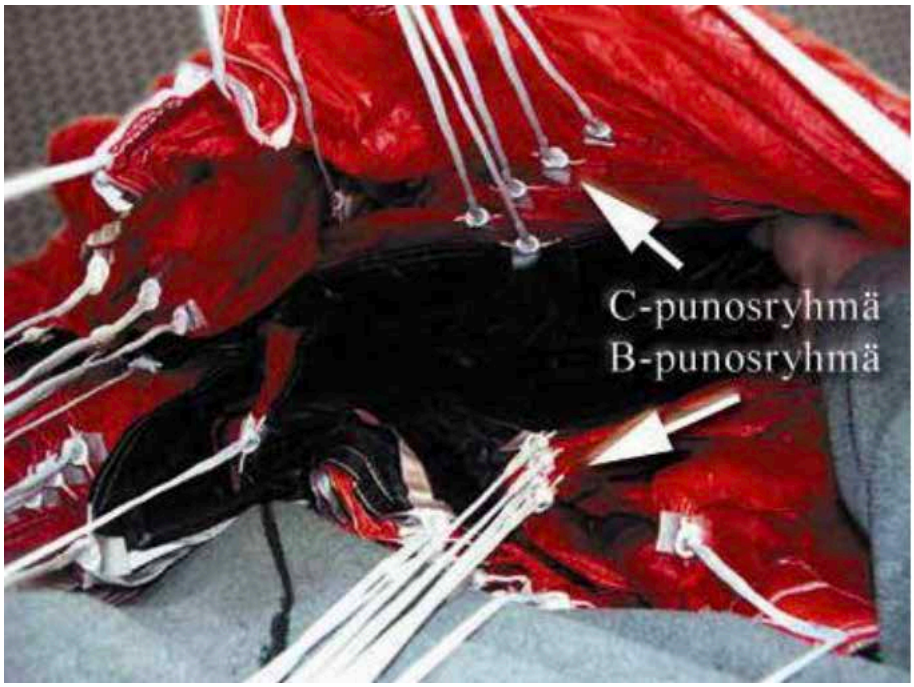
- Count the tunnels (9 tunnels).

7.9

- Align the tunnels and place them between your legs.

7.10. "Punosryhmä" = "line set".

· Make a flake between A and B line sets on the right side.



7.11. "Punosryhmä" = "line set".

· Make a flake between B and C line sets on the right side.

7.12. "Punosryhmä" = "line set".

- Make a flake between C and D line sets on the right side.

7.13. Ohjauspunokset = "steering lines".

- Push the tail fabric to the side under the steering lines.
- Repeat everything to the left side.

7.14

· Gather the lines together to the middle each on their own sets (5+5 lines/set, steering lines 4+4).

7.15

· Push the slider to the side between B and C line sets. Also to the front and back from the middle.

First check-point.
Instructions for checking you can find from the ***chapter 22.1***.

7.3 Packing a parachute until 2nd check-point

7.16

- Set the tail of the canopy up on top of the slider and line attachment points. Wrap it around.

7.17

- Take the lines with a firm grip to one hand from the line attachment points.
- Wrap the tail of the canopy around the canopy.
- Release the tunnels.

7.18

- Adjust the tunnels to be on the same level with the rest of the canopy.

7.19

- Tighten the sides of the tail.

7.20

- Roll the tail 5-6 times. Keep a tension on the tail constantly.
- Do not roll the tunnels, lines or excess fabric between the tail.

7.21

- Keep a firm grip on the canopy and lines and carefully set the canopy on the ground while maintaining good line tension.
- Take the deployment bag close to the canopy.

7.22

- Place your knees on top of the canopy so the canopy and the lines stay put. Be careful not to kick the lines.

7.23

- Remove extra air away from the canopy and roll it to be slightly wider than the deployment bag.
- Try to keep the canopy as flat as possible.

7.24

- Fold the bottom of the roll on top of the rest of the canopy to a S shape. Place your knee on top of the fold so it will stay in place.

7.25

- Fold the top of the roll on top of the previous fold and place your knee on top.

7.26

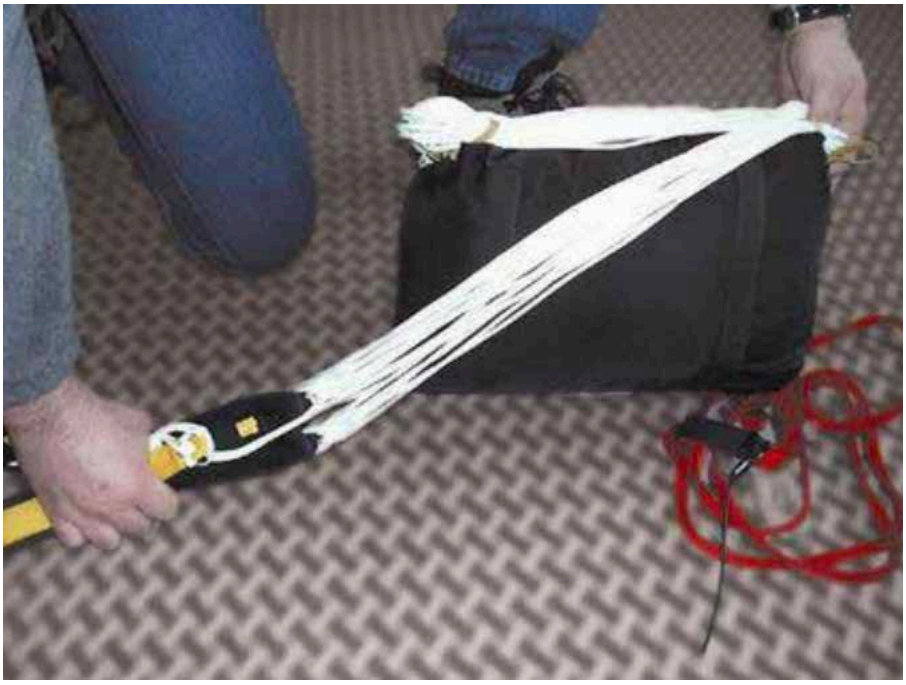
- Place the flap from the deployment bag under the canopy and pull the deployment bag around the canopy. Fill the deployment bag evenly.
- Keep a good line tension throughout this process, make sure slider stays up against the line attachment points.
- Pull extra bridle away from the deployment bag and check that there is no fabric between the bridle and the garment on the deployment bag.

7.27

- Close the deployment bag with rubber bands with double stows.
- Make the rest of the stows also tight, long rubber bands always as a double!

7.28

- Excess line length from the stows are around 5cm.



7.29

- Leave around 30–40cm extra lines unstowed.

Second check-point.

Person who is checking the second check-point oversees the rest of the process all the way through!

Instructions for the checking can be found from **chapter 22.2**.

From this point on, the packing continues to closing the harness. There you should follow the instructions given by your local club! Licensed skydivers follow manufacturer instructions when closing their own gear.

PART II – BASIC TRAINING

8a AFF Basic training

Basic training aims to develop strong stable exit and freefall skills with different tasks during freefall. Basic training includes for example turns, flips and back-flying. You will also learn to fly the canopy in a safe way, improve your landing accuracy and how to calculate an exit spot. Student status is valid for one year. If student status is expired, student must do again a written theory exam and practical exercises before jumping. Student must achieve minimum passing criteria to advance in the student program.

8a.1 AFF Jumps

- 8” short freefall (15a.1).
- Two 5” short freefalls (15a.2).
- Back flying (15a.3).
- Tracking (15a.4).
- FS-tracking (15a.5).

8a.2 Other tasks, AFF

- 5 Exit spots and landing according to a plan made with an instructor.
- Under the canopy most important things to practice:
    - Symmetrical and sharp landing flare from full-flight position
    - Adjusting the landing pattern according to the wind conditions
    - Holding at the holding area for longer to give others space to land.
- Practical test on gear checks.
- Written theory test from the chapters 16–20 and 28.

8a.3 Time limits, AFF

If a basic training student has more than 30 day break, the student has to jump 15” short freefall as a recurrency jump before advancing to the next jump. Instructors or coaches can require other tasks if necessary.

8b Static line Basic training

Basic training aims to develop strong stable exit and freefall skills with different tasks during freefall. Basic training includes for example turns, flips and back-flying. You will also learn to fly the canopy in a safe way, improve your landing accuracy and how to calculate an exit spot. Student status is valid for one year. If student status is expired, student must do again a written theory exam and practical exercises before jumping. Student must achieve minimum passing criteria to advance in the student program.

8b.1 Static line jumps

- 15” (15b.1).
- Floating exit (15b.2).
- Diving exit (15b.3).
- 360 degree turns (15b.4).
- Back flying (15b.5).
- Barrel roll and backflip (15b.6).
- Tracking (15b.7).
- FS-tracking (15b.8).

8b.2 Other tasks, SL

- 5 Exit spots and landing according to a plan made with an instructor.
- Under the canopy most important things to practice:
    - Symmetrical and sharp landing flare from full-flight position
    - Adjusting the landing pattern according to the wind conditions
    - Holding at the holding area for longer to give others space to land.
- Practical test on gear checks.
- Written theory test from the chapters 16–20 and 28.

8b.3 Time limits, SL

If a basic training student has more than 30 day break, the student has to jump 15” short freefall as a recurrency jump before advancing to the next jump. Instructors or coaches can require other tasks if necessary.

9 Exit

Exit and first couple of seconds in a freefall is usually something students have no recollection of during the first jumps. Experience usually helps to maintain time awareness during the entire jump. Time awareness might also get lost while doing some task or trying to fix some problem during the freefall. Especially in the early stages of a student program usually good exit equals good jump. Later a successful exit helps during short freefall jumps or when jumping with a group. Regardless of the chosen exit style the basic principle is to use relative wind to get desired position and heading and maintain them.

Exit is always part of the evaluation and the most important part of the exit is using the relative wind and direction of launch. Exit also might take time to set up, and that must be noted when planning the exit spot. Goal is to get a good routine on different types of exits and maintain time awareness and memory throughout the entire jump.

9.1 Hanging exit

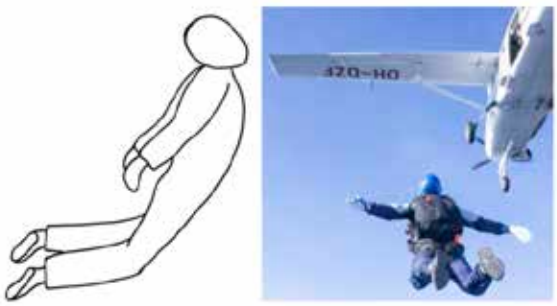
9.1.1 Strut plane

- Climb out the plane using the plate and the strut. Be careful and avoid rubbing your gear to the plane while climbing out. Chest to the direction of flight.
- Drop your legs one by one to the airflow, do not jump.
- Hold on to the strut arms about shoulder width apart and take X position and arch to the relative wind.
- Release your grip symmetrically.
- When your orientation slowly turns to horizontal (usually in about 5 seconds) take the basic freefall position (10.1).

9.1.2 Problems

If legs are bent, it might cause a backflip.
Negative arch turns you on your back.
Jumping from the plate to the airflow might cause a premature falling from the plane.
Launching with arms might turn you on your back.

9.2 Floating exit



9.1 Floating exit

9.2.1 Strut plane

1. Climb outside the plane and be careful with your gear.
2. Left leg on the step (over the wheel), right leg in airflow.
3. Hands to the edge of the door frame.
4. Look forward and present chest towards the airflow.
5. Launch yourself backwards, chest directed to the relative wind.
6. Arch, head back, legs almost completely straight, arms back to the delta position.
7. Once the orientation slowly turns horizontal (usually about 5 seconds), change to the basic freefall body position (10.1).

9.2.2 Other planes

1. Move to the door (protect your gear) either in poised position or standing up.
2. Launch forward, chest to the relative wind and the direction of flight.
3. Arch, head back, legs almost completely straight and arms to the side to the delta position.
4. Once the orientation slowly turns horizontal (usually about 5 seconds), change to the basic freefall body position (10.1).

9.2.3 Floating exit, AFF

1. Move to the door (protect your gear) either in poised position or standing up.
2. Launch forward, chest to the relative wind and the direction of flight.
3. Arch, head back, arms and legs to the basic freefall body position.

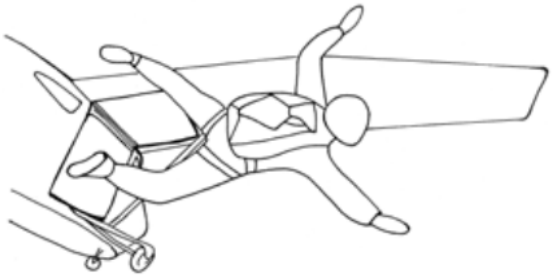
9.2. Floating exit, AFF.

9.2.4 Problems

1. Arms too far forward causes a flip.
2. Launch to the side will cause falling on your side.
3. Lazy body position will cause falling on your back.
4. Insufficient launch from a strut plane might cause a hit with the step.

9.3 Diving exit

9.3. Diving exit, door on the left side of the plane.



9.4. Diving exit, door on the right side of the plane.

9.3.1 Strut plane

1. Right leg on the step.
2. Left hand on the strut, right hand in the airflow (or elbow resting on right knee).
3. Lift (carefully so you do not hit your gear to the plane) yourself outside.
4. Launch yourself to the airflow and maintain basic body position, chest presented to the relative wind.
5. Position turns to horizontal usually within 5 seconds.

9.3.2 Other planes

1. Move towards the door carefully while protecting your gear.
2. Launch yourself to the airflow towards the tip of the wing while presenting your chest to the relative wind.
3. Position turns horizontal usually within 5 seconds.

9.3.3 Problems

1. If chest is not presented to the relative wind, body position will fall.
2. Non-symmetrical positioning of limbs might cause turning, roll or plunge.

9.4 Group exit

Exit execution usually depends on the number of jumpers and what type of plane is used, but a successful exit always requires simultaneous launch and good presentation to the relative wind. Simultaneous exit is achieved by doing an exit count, that one of the jumpers starts (ready) and others join (set, go). Correct launch position, in other words presentation to the relative wind makes it possible to achieve good body position right away after the exit. If the count and presentation is not good enough, exit will fail.

Practicing exit is as important as practicing actual freefall, since a calm and successful jump starts from a good exit and failed exit wastes a lot of time from the start.

Sitting on the wheel or strut is not allowed.

9.5. FS-exit.

9.5 Other exits

Jumping from other aircrafts such as helicopters, hot air balloons etc. always require extra planning and practicing. Basic idea is to drop straight down towards the relative wind while standing up.

9.6 Practice

1. Watch different exits from the parachuting committee website with an instructor. laskuvarjotoimikunta.ilmailuliitto.fi/materiaalipankki/materiaalipankki-videot.
2. Discuss with an instructor how jumper(s) uses relative wind with different exits.
3. Practice exits in the plane or a mock-up with an instructor.
4. Practice on your own and show a floating- and diving exit to your instructor.

10 Basic maneuvers during freefall

Maneuvers during freefall require stability and control of your body position and time- and altitude awareness. Problems in freefall will be repeated if they are tried to be fixed by force or in a wrong way. Relaxed body position combined with a proper arch will minimize the problems. If problems are not fixed even after trying to fix them, deploy your parachute right away!

10.1 Basic body position

Maneuver practices are started around 8 seconds after the exit, after the jumper has almost reached the terminal velocity. Every maneuver starts from basic body position and altitude check. New maneuver in a sequence is started once the previous maneuver is completely stopped. Maneuvers are always stopped latest at 1400m (during some more difficult jumps the stopping altitude might be much higher) and concentration is aimed at deployment. Transition to basic body position happens 3-5 seconds after the exit.

Basic body position:

- Arch from hips and chin up.
- Arms 90 degrees bent from elbows and 90 degrees from body. Legs are slightly spread, knees on the same level than shoulders.
- Shins presented to the airflow.

10.1. Basic freefall body position.

10.2 Turn

Lean the leading arm and shoulder down, you can speed up the turn by twisting your body, bending your leg or turning your head. Turn is performed by:

1. Check altitude.
2. Take a fixed point 45 degrees from the ground, for example a large landmark.
3. Shoulder is turned to desired direction.
4. Take basic body position before you reach the fixed point.
5. Just before the fixed point perform a slight counter movement to stop the turn.
6. Check altitude.

10.2. Turn.

10.3 Back flying

During back flying a chest mounted altimeter might not show a correct reading and your freefall speed increases. If you lose control while back flying (flat spin), turn your orientation back to belly to earth and take the basic body position and arch. If you do not get the position under control, deploy your parachute. During back flying the pilot chute might escape from a loose pocket or improper closing loop might cause a premature opening.

Back flying is performed by:

1. Check altitude.
2. Turn to your back by bringing shortly one arm in front of the body and look to the direction of your extended arm.
3. Return arms and legs to symmetrical body position after you are on your back.
4. Count and maintain back flying body position for 4 seconds.
5. Return to basic body position by bringing one arm in front of your body and look to the direction of the hand that you brought in. Press extended arm against the airflow.
6. Take a good arch right after you have returned to basic body position.
7. Check altitude.

10.3. Back flying.

10.4 Front flip, AFF-training (level 7)

Front flip:

1. Check altitude.
2. Move your arms to the side.

3. Extend your legs and bend downwards with your upper body.
4. When the body position turns to your back, bring your legs close to your chest to finish the flip.
5. Take a good basic body position after the flip is complete, maintain good arch.
6. Check altitude.

10.4. Front flip.

10.5 Barrel roll

Barrel roll:

1. Check altitude.
2. Bring one arm in front of and under your body, look towards the extended arm.
3. Right away after turning on your back extend the arm that was under your body and bring previously extended arm in front of your body. Push towards the airflow with your extended arm.
4. Twist your body and maintain eyes towards to direction of movement.
5. Take basic body position and arch.
6. Check altitude.

10.5. Barrel roll.

10.6 Back flip

Back flip:

1. Check altitude.
2. Bring knees together and pull your legs quickly towards your chest, keep your chin up. At the same time extend your arms forward slightly spread apart.
3. While rotating, push slightly against the airflow with your arms.
4. When you see the ground, extend your legs to stop rotation and take a good arch.
5. Check altitude.

10.6. Back flip.

10.7 Tracking and FS-tracking

The goal while tracking is to gain as much horizontal separation to other jumpers as possible. Tracking is not diving. FS-tracking includes altitude check, break-off signal, 180 degree turn, tracking towards a free airspace, airspace check after the track and deployment signal and a practice pull. Vertical speed might increase during tracking. Altitude awareness is important since stopping the track takes time too. Deployment while tracking is not advised. Good tracking is a fundamental skill for a good skydiver, since only by good track a sufficient separation between skydivers is achieved for deployment!

Tracking:

1. Check altitude.
2. Take a fixed point from the ground up front.
3. Extend your legs.
4. Bring arms to about 45 degree angle in relation to your body, once your skills improve, take them closer to your body. You are now in delta-track.
5. Reduce your arch and keep your arms at the same level than your body. Bring your chin slightly towards your chest.
6. Steer with your hands.
7. Maintain altitude awareness, keep an eye on other skydivers and track towards the fixed point.
8. Return basic body position calmly by arching first to delta position.

9. Return arms and legs to the basic body position.
10. Check altitude.

10.7. Delta-track.

10.8. Almost proper tracking position, arms are still bit too high.

10.9. Tracking body position.

10.8 Dangers

1. Stiffness causes swinging (like a leaf from a tree). Relax.
2. Body position is not under control and altitude awareness is forgotten.
3. New maneuver is started too low.
4. In some body positions the altimeter might be hard to read or it gives a false reading.
5. Asymmetry causes flat spin. Check altitude, relax your body, arch, and if necessarily make a counter movement with your shoulders. You can also bring your legs closer together. If you do not regain control with one proper try within 5 seconds (spinning is accelerating and out of control = flat spin) à ARCH, REACH, PULL (=deploy your main parachute).

10.9 Exercises

1. Watch basic maneuvers in freefall from the parachuting committee website with an instructor. laskuvarjotoimikunta.ilmailuliitto.fi/materiaalipankki/materiaalipankki-videot.
2. Practice maneuvers on the ground with an instructor one by one.
3. Practice maneuvers (turn, delta, tracking) with belly boards and/or in a freefall harness.

11 Weather

According to the instructions given by the aeronautical association there must be devices to show the wind direction and strength at the dropzone. Additionally you can observe the wind by looking at trees, bushes, surfaces of lakes, clouds, wind sock, streamers and planes. More experienced skydivers will gladly tell you how they judge if the winds are too high, clouds too low or at some parts of the landing area is too turbulent to land. Weather related learning continues throughout the whole student career. The goal is to know the local conditions so well that you can make a good decision about jumping.

11.1 Wind

Winds can prevent jumping, since stronger winds cause more turbulence. Higher winds also makes spotting, steering the canopy and landing more difficult.

Wind limits for skydivers are set in operational instructions, but sometimes turbulence might be too bad even if the wind is not over the limit. Wind direction and strength must be identified both for lower and upper winds. Wind speed in meters per second is wind speed in knots multiplied by 0,51. When calculating without a calculator, 0,5 is a good coefficient. It is good to remember that 16 knots is over 8m/s (8,23) and 22 knots is 11,32m/s. Lower winds is the wind that is affecting the ground and upper winds affects the jump run. In the northern hemisphere typical difference in wind direction between lower and upper winds is around 30 degrees to the right caused by the earth rotation. Wind directions can vary between different altitudes. Term “upwind” means area from the landing area towards the exit spot and “downwind” means the area away from the landing area in relation to the exit spot. Usually wind speed is higher in higher altitudes, since the friction caused by the ground is lower. Even if it’s completely calm on the ground, the wind might be strong higher up. Weather fronts (thunder) makes the wind stronger and temperature differences between areas causes sudden changes in wind strength and direction. Near ocean wind can change to completely opposite in the morning and evening (sea wind phenomenon).

In completely calm weather the flare timing might be hard.

11.1.1 Wind limits

Ground wind limits for skydiving is:

- Licensed skydivers:
  - A-license 8m/s
  - B-license 11m/s
  - C-license 11m/s
  - D-license 11m/s.
- Students are not allowed to jump if the wind is higher than 8m/s, tandem students cannot jump if the wind is higher than 11m/s.
- Skydivers who are using round canopy on either main or reserve canopy cannot jump if the wind is higher than 8m/s.

11.2 Clouds

For students clouds prevent jumping when the clouds prevent visibility below the exit altitude. During exit either the exit spot or landing area must be visible.

According to the regulation (OPS M6-1) this can be exceptions. However those exceptions set additional requirements for jumper, pilot and planes equipment. Clouds are divided between low clouds (0-2500m), middle clouds (2500-5000m) and high clouds (over 5000m). Clouds can be categorized in for example cumulus, nimbus, thunder or fog.

OPS M6-1 also defines cloud altitude, officially called a ceiling and it is defined by rules of flying (SERA) and it means lowest, more than half the sky covering cloud layer's lowest point from the ground. In practice, if there is BKN or OVC (11.7), then more than half of the sky is covered by clouds.

You don't need to know all the different types of clouds, but an anvil-shaped thunder cloud (Cumulonimbus, Cb) must be known and all skydiving operations must be put on hold if that type of cloud is near the airport. Clouds are formed by the moisture and air impurity, so during freefall a skydiver that goes through a cloud gets wet or gets uncomfortable rain or hail to their face. It also should be noted that hot and moist weather does not carry as well as dry and cold. Moist air can affect the performance of the canopy by lowering it.

If you need to deploy while in cloud or get in to a cloud after deployment:

- Fly with half brakes.
- Make a slight right turn constantly.
- Observe the front and side sectors all the time.
- Make noise and listen if you have doubt that you might not be alone in the cloud.

11.3 Thermal

Thermals mean lifting air flow are formed on top of areas warmed by the sun. Wind "collapses" thermals, so they might be directly on top of an area or close to them downwind direction. Cold spots and areas such as lakes cause opposite air flow. In clouds there might be air flow to both directions. Air flows caused by temperature changes usually are 1-8m/s. In thunder clouds flow might be even 30m/s up and down. A rule of thumb is that where there is a lifting airflow, there is an opposite airflow nearby, and this must be taken in to account when planning your landing pattern on a hot and sunny day. At a dropzone these air flows are created by for example target area sand, runways and open fields. These air flows might feel during canopy flight as an uncomfortable shaking and turning. Canopy might even collapse, lift, descend or even stall.

11.4 Turbulence

Turbulence is formed by the wind and by the obstacle together. Turbulence might be present also close to wind layer borders. It might be strong, sharp, lifting or descending, depending on the shape of the obstacle and strength of the wind. Slope wind is always turbulent. Turbulence causes the same problems with the canopy than thermals, so local turbulent spots should be known when planning your landing pattern. Strong turbulence might collapse your canopy partially or

even completely. Canopy will recover when it reaches a correct angle of attack in relation to the relative wind. Directly beneath turbulence is usually a calm spot, so correct timing for a landing flare might be difficult. Skydiving during severe turbulence is always dangerous and should be avoided, even if winds would not be over the limits. Canopies are not designed to be used in turbulent weather! If for some reason you get in to turbulent conditions, fly your canopy in full flight. Flying with too much brakes might cause your canopy to stall in turbulence. You can avoid turbulence while landing by aiming to an open area, with enough distance to the obstacles.

11.5 Temperature

Temperature drops with higher altitude with an estimated rate of 6,5 degrees / 1000m. This rate is a rough estimate since it is also affected by inversions (temperature rise while going to higher altitude), weather and local changes in air pressure.

A skydiver should wear gloves when the temperature goes below freezing during the skydive. Students must wear gloves always. Even though it would be warm on the ground, it might be below freezing at jumping altitude. If the temperature on the ground is +10 degrees, it usually means that it is -2 degrees at 2000m altitude.

11.6 In practice

Best weather for skydiving in Finland is during early and late summer during mornings and evenings. During these times the changes in weather is as its smallest. Wind is weak, sun doesn't cause that much thermal effect and air pressure and moisture are optimal. Weather should be checked always before skydiving.

Data from weather stations at the airport, internet and different instruments are always absolute information if otherwise there is uncertainty. They support each other and do not exclude one another. Remember that access to the sky is not a guarantee for a successful skydive, successful landing is.

You can get weather station data from for example:

- Internet (www.ilmailusaa.fi).
- Windy (windy.com)
- Automatic weather reports by phone and radio.
- Weather reports at text-tv. (www.yle.fi/tekstitv/html/p428_01.html).

11.7 METAR

METAR report is a report made for aviation and is created at the local weather station at the airport. METAR tells you the current weather. In Finland METAR is generated every 30 minutes (20 and 50 past every hour) at the airports that has traffic regularly.

300 m	600 m	1000 m	1500 m
1000 ft	2000 ft	3300 ft	4900 ft
2000 m	2500 m	3000 m	4000 m
6600 ft	8200 ft	10000 ft	13000 ft

11.1. These estimated conversions must be memorized. 1 feet = 0,3048m.

EFOU 081250Z AUTO 2700KT 9999 SCT055 FEW080 08/04 Q1015

This message can be broken in parts:

- EFOU Weather station by its ICAO-code. Europe, Finland, Oulu.
- 081250Z Time (UTC), date and time in UTC time.
- AUTO, report is automatic, if AUTO word is not present, report has been made manually.
- 27006KT Wind direction in degrees and speed in knots. 270 degrees, 3m/s.
- 9999 Visibility in meters, over 10km.
- SCT055 Cloud amount and altitude.
- FEW080 Cloud amount and altitude.
- 08/04 Temperature and dew point in Celsius.
- Q1015 Air pressure in millibar / hectopascal.
- Additional info is at the end of the METAR.

In METAR the wind direction is given in three numbers rounded to the closest ten degrees. Wind speed is in knots (KT). When there is no wind, it is presented in the METAR as 00000KT.

- VRB02KT: Direction varies, speed 1m/s.
- 18010KT: Wind direction from the south (180 degrees), speed 5m/s.
- 22015G28KT: Wind direction 220 degrees, 7,5m/s average and gusts up to 14m/s.
- 35014KT 310V030: Wind direction varies in a way that average cannot be determined and average speed is 7m/s. Wind direction varies between 310 and 030 degrees.

METAR tells you weather phenomenon, such as fog, rain, thunder and other factors affecting the weather.

Examples on these reports:

- TS: Thunder without rain.
- TSRA: Thunder and rain.
- +VCSH: Heavy rain nearby the airport.
- -RA BR: Light rain and mist.
- FG: Fog.
- MIFG: Low altitude fog.
- -DZ BR: Sprinkle and mist.

in METAR the altitude of the cloud bottom is presented by leaving two last zeroes away. For example if the bottom of the cloud is at 300ft, it is reported 003, 3000ft is 030 and 30000ft is 300. Altitude is always above the ground level.

Sky is divided in eight sections while reporting the clouds. Clouds are reported with a three letter combination that represents how many eighths of the sky is covered at a certain altitude:

- NCS/NCD = no (nil) significant cloud / no cloud detected.
- 1/8–2/8 FEW = Few clouds.
- 3/8–4/8 SCT = Scattered.
- 5/8–7/8 BKN = Broken.
- 8/8 OVC = Overcast.

Clouds might also have an additional description CB and TCU:

- CB – Cumulonimbus, thundercloud.
- TCU – Towering Cumulus.

Examples on cloud reporting:

- FEW007 – Few clouds at 700ft above the ground level.
- SCT020 – Scattered clouds (3/8 of the sky is covered) at 2000ft altitude.
- BKN080 – Broken clouds (5/8 of the sky is covered) at 8000ft altitude.
- OVC003 – Overcast at 300ft.

Acronym CAVOK stands for “Ceiling and Visibility OK”. It is used when the following criteria is met:

- Visibility is over 10km or over.
- There are no clouds below 1500m (5000ft).
- There are no remarkable weather phenomenon such as thunder, rain or fog.

11.8 LLF

LLF (Low level Forecast) is an aerial weather forecast for aviation performed in a lower altitudes presented with a picture. Picture offers quick overall glance on a skydiving weather. Forecast can be also read in a text, where Finland is divided in three areas. Each area is divided in to sections, and those sections divided to even smaller sections. Sections can be found in for example material provided by Finnish Meteorological Institute. Text base forecast is much more detailed than the picture.

LLF forecast is divided to time-axel which are 2 hours long. Each axel presents average weather conditions within that period. LLF forecast is done three times per day for whole country. Validity for the forecast is during the summer 04–11, 08–16 and 12–20 UTC and during winter 05–13. 09–17 and 13–21 UTC.

Example on text forecast:

FBFN20 EFRO 091100
OVERVIEW FOR AREA fi3 ISSUED 091145
VALID THE 9 OF JULY 2020 BETWEEN 12 AND 20 UTC

Weather overview
Warm and moist air spreading from southeast to Finland. Locally occurs rain showers.

Visibility below 5 kilometer or cloud base below 1000 feet
16–20 UTC: The whole area except fi30

Moderate or severe icing
16–20 UTC: The whole area

Moderate or severe turbulence
Is not expected during the forecasted period.

FBFN21 EFRO 091100
FORECAST FOR THE fi30 PART OF AREA fi3 ISSUED 091145
VALID THE 9 OF JULY 2020 BETWEEN 16 AND 20 UTC

Moderate or severe turbulence
16–20 UTC: The whole area: Is not expected during the forecasted period.

Moderate or severe icing
16–20 UTC: The whole area: moderate ice FL080 à FL125

Visibility/Weather/Clouds
16–20 UTC: The whole area: Visibility > 8km.
Cloud base 3000–3500 ft, locally 2000–2500 ft.

Cloud top
16–20 UTC: The whole area: Cloud top > FL125.

CB/TCU clouds
16–20 UTC: The whole area: ISOL CB.

Zero degree isotherm
16–20 UTC: Zero degree FL050–FL090.

Surface winds
16–18 UTC: Area fi30d: E-SE/5-8 knots, gusts up to 13 knots.
Area fi30b: SE/6–10 knots, gusts up to 18 knots.
Area fi30a: E/5–11 knots, gusts up to 16 knots.
Area fi30c: NE/3–9 knots, gusts up to 16 knots.
Area fi30e: NE/2–9 knots, gusts up to 15 knots.

18-20 UTC: Area fi30d: E-SE/2-5 knots, gusts up to 10 knots.
Area fi30b: SE/3–6 knots, gusts up to 14 knots.
Area fi30a: NE/0–6 knots, gusts up to 10 knots.
Area fi30c: N-NE/0–5 knots, gusts up to 9 knots.
Area fi30e: E/1–7 knots, gusts up to 11 knots.

Average wind and temperature within the area 2000ft
16–18 UTC: 150/10kt +9.

18–20 UTC: 100/9kt +10.

FL50
16–18 UTC: 120/8kt +3.
18–20 UTC: 150/9kt +3.

FL100
16–18 UTC: 180/10kt –6.
18–20 UTC: 250/12kt –6.

Lowest QNH
1003 hPa.

Beware: only widespread mod or sev icing and turbulence are forecasted in LLF.
Absence of icing and turbulence in the forecast does not preclude the presence of light icing and turbulence.
For indication of light icing, please check for forecast cloud top extending above freezing level.
Occurrence of TCU or CB always implies risk of mod/sev icing and turbulence even though not stated explicitly.

Forecast above is done 9.7.2020 at 11:45 UTC and forecast is valid in area fi3 (Northern Finland) between 16–20 UTC. First there is short description about weather in Northern Finland and then description including information about visibility and clouds, icing and turbulence.

In this case there is bad visibility or low clouds in whole Northern Finland, except section 30 and moderate or severe icing in whole Northern Finland. After that LLF is divided in to forecast to each section separately, example includes forecast only for section 30.

In section 30 does not expect turbulence within time period, but moderate icing is expected above flight level FL080. Visibility is expected to be over 8km.

Altitude for clouds is expected to be 3000–3500 and 2000–2500 in some places, altitude in feet. Highest clouds are expected to go as high as above flight level FL125. Individual CB clouds are expected and freezing point is somewhere between FL050 and FL090.

Ground wind direction varies during 16–18 UTC between smallest sub-sections. For example section 30a wind direction is E-SE (east to southeast). Wind speed is between 5-8 knots and gusts 13 knots. Section 30c wind direction is NE (northeast) and speed 3–9 knots and gusts up to 16 knots. At 2000 feet wind direction is expected to be between 100–150 degrees up to 10 knots and temperature 9-10 degrees Celsius. FL050 wind direction varies between 120–150 degrees up to 9 knots, temperature +3 degree Celsius. FL100 wind is expected to turn from south to west-southwest (180 degrees à 250 degrees) and getting higher up to 12 knots, temperature –6 degrees Celsius.

Lowest QNH-value is expected to be 1003 hPa around the area.

More information about aviation weather and aviation can be found from Traficom website and Finnish Meteorological Institute website.

11.9 Exercise

1. Get to know websites for aviation weather:
   - METAR = Current weather at the airport.
   - TAF = Forecast at the airport.
   - LLF = low level forecast.
   - Windy = Multipurpose graphical website.
2. Find spots from the map that might cause turbulence or thermals.
3. Get to know local characteristics for weather at your home dropzone.

12 Spotting

Exit spot is calculated by combining drifting in a freefall and drifting under a canopy together. With this we know where to jump out from the plane in a way that jumpers can get back to the landing area safely. Exit spot and jumprun is always determined before starting operations. If there is a possibility that weather conditions have changed, the exit spot should be calculated and determined again.

During the basic training phase students have to determine 5 times independently the exit spot and the landing should happen to a predetermined area.

In this chapter gives you numbers as a guideline to calculate the exit spot. However skydivers are using a lot of different kinds of canopies and wind information quality varies, so if jumpers have difficulties reaching the landing area, the exit spot should be adjusted accordingly.

Also ground personnel can observe the plane drifting during the jumprun (sideway drift caused by the wind). These observations can be used to adjust the exit spot for upcoming loads. Open canopies and their movements in relation to the ground wind and if people are having difficulties getting to the landing area can also be used to adjust the jumprun and exit spot. If the landing area is small and there are a lot of canopies open at the same time or the wind is strong, determining the jumprun and exit spot well are more important.

12.1 Drifting

Drifting in a freefall and under the canopy can be calculated if we know the winds from all the layers between the ground and the exit altitude (drift = wind speed m/s times time in seconds). Upper winds can be asked from a local weather station or looking them up from the forecast. Also you can ask from the pilot if the plane has a GPS system. With wind information you can calculate the drifting distance and direction or make an estimate for drifting. On top of the wind information you need to estimate the time spent in different layers:

- Freefall can be estimated to be 50 seconds with a 3km exit altitude.
- Canopy sinks with an average rate of 5m/s.
- We can assume the canopy to be completely flying between 800-1000m altitude.
- Time under the canopy can be estimated with these specs to be around 3 minutes (180 seconds).

The following table is calculated by using assumptions above (to the closest 100 meters) for drifting under the canopy and in freefall with different winds.

Wind (kt)	Under the canopy (m)	Freefall (m)
5	500	100
10	900	300
15	1400	400

20	1900	500
25	2300	600
30	2800	800
35	3200	900

12.1.1 Drifting under the canopy

In order to calculate the drifting under the canopy we need the deployment altitude and wind information from a ground level: speed and direction. Ground wind can be excluded from calculations and use wind direction and speed at altitudes 1000 and 2000 feet. Wind direction and speed can be averages.

Example:

Altitude (ft)	**Direction**	**Speed (kt)**
2000	250	10
Ground	230	5
Average	*240*	*7,5*

12.1.2 Drifting during freefall

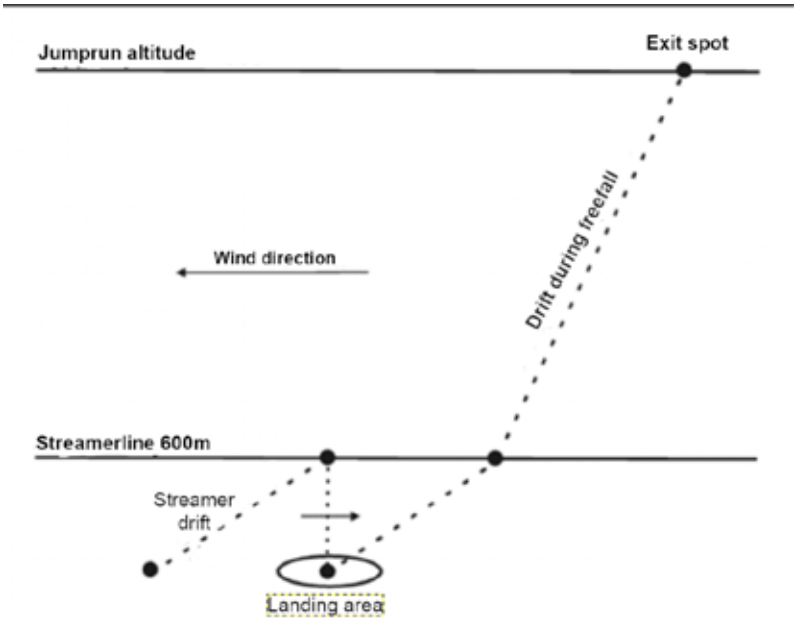
Drifting during freefall is calculated by using wind information between exit altitude and deployment altitude.

Example:

Altitude (ft)	**Direction**	**Speed (kt)**
12000	290	20
9000	270	15
6000	260	15
3000	250	10
Average	*270*	*15*

Drift during freefall is 400 meters, exit spot is hence located 0,4km from deployment location to direction 270.

Exit spot is amount of drift towards the wind (upper wind direction) in relation to the landing area. Exit spot is shown to the pilot and other skydivers by using a map or told verbally.



12.1. Exit spot calculations from higher altitude.

12.2 Jumprun

If there are multiple skydivers/groups in the plane, jumprun is determined keeping in mind that:

- Jumprun goes through the planned exit spot.
- There is safe distance between groups.
- Each skydiver must be able to get to the landing area safely.

With small planes the jumprun is usually heading straight in to the wind through the landing area. With bigger planes the jumprun is usually either to a crosswind or for example always same direction than some fixed land mark, for example runway. Distance from the landing area is dependent on a wind speed and direction. Jumprun can be also with tailwind, if necessary.

There is no right answer to a length of a jumprun, but it can be determined as follows.

Parachute glide ratio is between 3:1 and 2:1. If skydiver has a flying parachute at 800m altitude and starts the landing pattern at 300m, skydiver can fly about (500m x 2,5) 1300m distance.

By this quite conservative example first group could exit 1300m before the optimal exit spot and last group 1300m after it.

In reality the length will vary depending on the jumprun direction, landing area, deployment altitude and so on. The greater the distance from the optimal exit point is, the greater the risk that inaccurate wind information, sudden change in weather, low deployment or emergency procedures leads to off-landings.

12.3 Jumping at pre-determined spot

Instructions is given to a pilot before the flight and pilot flies to a planned jumprun once the plane reaches planned exit altitude. Jumprun starts already before the planned exit spot. Observe possible drifting caused by a wind already during climb.

12.3.1 Instructions to the pilot

Pilot usually has to give permission to open the door. Pilot gives the permission once air traffic controller has given permission to open the door and other aviators in the area are notified. If jumprun needs corrections, corrections are given by hand signals right/left/straight.

Corrections can be given also in degrees (for example “LEFT 10 DEGREES”) by yelling or with a radio (big planes). The most important thing is that corrections are given clearly and calmly. You have to remember your position in the plane, pilot might have hard time seeing corrections in some planes. Obsolete corrections must be avoided and plane should be able to settle straight in between corrections.

12.3.2 Forward throw

Plane throws skydivers forward in relation to the direction of flight. In normal cases the throw is less than 200m. If the plane is especially fast one, throw might be higher.

12.3.3 Spotting

While spotting at the door head is pushed outside and eyes directed straight down.

Planes orientation might cause following errors to spot:

- While the plane is climbing, we are looking slightly forward.
- While descending, we are looking slightly backwards.
- While turning, we are looking slightly to the side.

While the plane is level and flying straight, wing and horizon is aligned.

Also jumper might do following mistakes:

- Head is not all the way out; you are looking to the side.
- Looking to the direction of the flight is causing wrong estimation of location.

12.3.4 Before and during exit

Before exit skydiver must make sure that the airspace below is free. Planes and skydivers below must be avoided. Also crossing flight paths must be checked. Skydivers must take in to account time that it takes to set up for group exit and door must be secured in a way that it stays open during the exit. Area near the door must be also cleared from any obstacles that might cause problems during the exit, for example seatbelts.

There must be sufficient exit separation between each exiting skydiver/group. Horizontal distance between individual skydivers should be at least 300m, between smaller groups at least 500m and with larger groups even longer. 8–10 seconds between skydivers and groups exiting is good general rule of thumb. Separation time is linked to the ground speed of the plane, which is changing according to the wind conditions.

Emptying the plane during one jump run is financially good idea, but when the distance to the planned exit spot gets higher, also the risk of off landings gets higher. Decision on a new jumprun might be difficult, but bad and long jumprun might cause dangerous situations also for other aviators in the area.

Gears must always be checked before the exit.

12.4 Exit order

Before boarding the plane each load determines in which order skydivers/groups are exiting, and the plane is usually boarded in reversed order. Upper winds are affecting more on slower falling skydivers and groups, so they drift more during the freefall than faster falling skydivers/groups.

Exit order also depends on the group size. Bigger groups exit takes longer time than smaller groups. Smaller skydivers and groups exits before faster. Before break-off and deployment the best separation between skydivers and groups are achieved by a correct exit order.

Usually exit order is:

- Big FS-groups.
- Small FS-groups.
- Individual belly fliers.
- Big freefly-groups.
- Small freefly-groups.
- Individual freeflyers.
- Tandems.
- Groups travelling horizontally (for example angle- and tracking groups) are placed depending on other groups.
- Wingsuit flyers.

Exit order is affected also by deployment altitudes. Jumpers who deploy higher than normal jumps last before wingsuits. While planning the exit order canopy formation skydivers and wingsuiters must be taken in to account in a way that they don’t cause danger to others. Notice, that also pilot must know the composition of the load.

12.5 Exercise

- Practice exit spot planning by using wind information.
- Practice briefing the pilot before the first load of the day.
- Practice jumprun flying and spotting.

13 Safe canopy flight and accurate landing

13.1 Fundamentals of safe canopy flight

How does weather effect on flight

You must constantly develop your skills on figuring out current weather conditions and understand especially wind effect on canopy flight. On top of effects of tail- and headwind you must understand effects of sidewind and how to fly your canopy in a sidewind. You must also learn the effects of turbulence and thermals.

Landing pattern

From the very beginning you must understand that landing pattern is helping landing accuracy and even more importantly, safety. Low altitude collisions under a canopy is one of the most common causes for fatalities in skydiving. Planned landing patterns are together with airspace awareness and giving others space to land by holding most effective ways to avoid low altitude collisions. Flying according to a planned pattern and respecting final approach direction is crucial for those reasons. You must learn to perform turns in the pattern according to the plan and fly the final approach to correct direction in a way that they also help with your landing accuracy.

Rules for avoiding collisions

You must learn rules for avoiding collisions when they start applying to you. In the beginning you are avoided under the canopy, and you are responsible to avoid those with a lower altitude and avoiding collisions by turning mainly right. When you gain more experience, there are even more rules for avoiding collisions. In general, licensed skydivers avoid students and faster canopy slower. Everyone avoids person who is under a reserve canopy and a tandem canopy. You must learn to avoid possible collision by using your rear risers right away after the deployment even before grabbing toggles.

Holding and giving others space

By holding we avoid being in the final approach together with others to avoid collisions in lower altitudes. During a normal jump it is normal that there are multiple canopies deploying at same altitude at the same time. We want to avoid that everyone enters the pattern and final approach at the same time, since it creates big risk for collisions especially on a smaller landing areas. This avoidance must be started right away after deployment since it is really hard to create altitude differences between skydivers during the landing pattern. Best way to gather vertical distances between skydivers is that those who are at lower altitude “gets out of way” by dropping altitude faster than those with higher altitude, those with higher altitude helps the situation by holding their altitude more by flying with brakes. Skydivers flying small and fast canopies might be unable to hold over for example student canopy even though they would try as hard as they can, so people flying bigger canopies must take this in to account and let those with smaller canopies pass them well before landing pattern. Holding is mainly done by using different flight statuses, but also can be achieved by more aggressive turns to burn altitude. However “drilling” (continuous turning to one direction) and sudden aggressive maneuvers are forbitten while flying in traffic.

Landing mistakes

You must learn the correct technique for landing and especially for flaring. At the beginning with slower student canopies flaring is performed with a different way than with more advanced canopies (one- vs two-stage flare). You should also be able to perform landing routinely well to small side-wind. This might require active steering all the way to the ground and also even asymmetric flare. While your equipment progresses, you must learn to recognize and avoid common landing mistakes. You can already during your student program read canopy flight portion of this guide where higher performance canopies and common landing problems (for example balance trap) are explained better. You must understand why landing body position and parachute landing fall (PLF) are important and you must be able to perform them well. Most student injuries could be prevented by proper landing body position and PLF.

Canopy flight in basic training

Keywords: *Avoiding collision after deployment, routine approach, landing pattern and holding.*

During basic training you should prepare that there will be other canopies in traffic with you. Learn to be able to avoid collisions by using your rear risers even before grabbing your toggles.

Notice your airspace, other canopies and your location without forgetting your altitude awareness and altitude relation to your location.

Flying in a correct direction in relation to the landing area based on current wind conditions should be routine to you during basic training in a way that you are able to enter the landing pattern in correct spot and correct altitude.

Flying planned landing pattern and final approach should be routine and well performed and well-timed landing flare even if the wind is slightly from the side. Think if the landing pattern given to you by instructors will work in this weather or should it have been altered slightly. Remember landing priorities!

Learn how to hold to give others space to land. You should avoid landing at the same time or right after another skydiver. If necessary, fly slightly with your brakes to hold, but keep in mind not to block people coming to land behind you.

Exercise

All skills listed above should be practiced on every jump if possible. There is also check-boxes in your logbook for most important skills to learn:

- Flaring from full flight status to full braked status symmetrically and quickly.
- Adjusting landing pattern according to weather.
- Adjusting landing order by holding.

13.2 Accuracy landing

Accuracy landing practices is designed to teach skills to estimate altitude and distances. The goal is for a student to be able to land safely close to a planned point (within 50m) in advanced training after acquiring necessary skills in basic training. Patterns and starting point of the final approach should be planned and mentally practiced before the jump. Landing pattern can be flown in a half braked status so small adjustments are easier to both directions. Towards the end phase of the final approach however should be flown in full flight status if the situation allows. Base leg in the landing pattern is flown in a way that the final turn to final approach (wind line) is performed, depending on the wind between 50-200m behind the planned landing spot. Final approach starts at about 100m altitude. At the beginning of landing approach glide angle is adjusted by either lifting or pulling the brakes. S-turns are strictly forbidden during final approach, since there might be other canopies near you and turning will cause a significant risk for a collision. Preparations for flaring are started at around 30-50m altitude, when at latest brakes should be released by lifting your arms and toggles. Do not lift your arms quickly, since it will momentarily raise your descent rate and while in low altitude this might be dangerous. Safety is the most important aspect in everything skydiving related activities. Do not stall your canopy or perform any major turns while in low altitude.

13.2.1 Planning

Importance of planning is no different in accuracy landings than in other activities. While on the ground, you should be aware of weather conditions, especially development of wind direction and speed. By observing others from the ground, you can spot possible thermals and turbulences. Before boarding the plane you should figure out the exit spot, wind sector that will get you back to the landing area and preliminary plan for a landing pattern and starting point for final approach.

13.2.2 Exit, deployment and approach

After exit and deployment while approaching you should make sure you can make it back to the landing area.

13.2.3 Landing pattern

During landing pattern the landing spot and wind sock should be visible at all times. Possible changes in wind direction or speed should be observed at all times. During base leg it is possible to move starting point for final approach by sliding slightly sideways.

13.2.3 Final approach

At the starting point canopy is turned accurately to the wind line (wind is coming straight behind the landing spot). Brakes are used to adjust descend rate in early phases of final approach. Canopy is kept in headwind at all times during final approach. Your body should be symmetrical, straight and relaxed in the harness. Canopy is steered all the way through the final approach towards the landing spot, but do not compromise safety over accuracy by flying too much with brakes or turning at low altitude. Preparations for flaring are started at around 30-50m altitude, when at

latest brakes should be released by lifting your arms and toggles. Flaring is performed as practiced, by pulling both toggles quickly and symmetrically all the way down.

14 Gear checks

Gear checks can be divided in to two categories.

1. Regular checks that are performed on certain time periods. Time periods are set by the aviation law OPS M6-1. Finnish Aeronautical Association has also made instructions for maintaining gear and also gear manufacturers set maintenance requirements for their products. These checks has to be done by a certified rigger, that are furthermore described in this guide in chapter 21.

2. During skydiving activities gear must be checked always before putting on, before boarding the plane and before exiting the plane (14.1–14.3). These checks are done by skydiver him/herself. For students the checks are performed by an instructor or a coach on the ground and in the plane, with an exception that advanced training students are responsible for their gear checks in the plane, and instructor or coach does the gear check on the ground before boarding the plane. Advanced students and licensed skydivers are always responsible that they perform gear checks to themselves and others before exiting the plane. Gear checks are essential part of skydiving training.

14.1 Checks before gearing up

Each skydiver chooses their gear according to their weight, skill level and instructions given by an instructor. Before gearing up for a jump, following points are checked:

- Personal clothing must be suitable for a current season and weather. Clothes must be warm and flexible, obsolete and extra clothing might make performing more difficult. Gloves must be suitable for the weather. Too thick gloves might make it harder to deploy your parachute or perform emergency procedures.
- Other necessary equipment checks are done to altimeter, helmet, goggles, hook knife, suit, gloves, shoes and life west (if necessary). All gear must be in working order and suitable for skydiving activities.
- Canopy type and deployment system is suitable for student, and he/she has received training to use them.
- Documentation for the complete skydiving rig and AAD must be checked. Main canopy checks, reserve parachute packing, reserve parachute and harness checks and AAD checks must be up to date according to the rules set by the manufacturer and Finnish Aeronautical Association rules and OPS M6-1 in aviation law.
- Packing card for main parachute has been filled correctly and is up to date.
- Gear is visibly in good shape. Harness fabric and straps are in good condition and all visible parts of the rig is in good shape.
- Flaps are closed correctly according to the instructions by the manufacturer.
- Handles are secured in their correct places.
- Pilot chute is packed well to the bottom of container. Only handle is visible and pilot chute starts to come out when pulled from the handle.
- Collapsible pilot chute is cocked.
- AAD is adjusted or turned on.
- Altimeter is set to zero.

- Gear is correct size and adjusted correctly, if necessary instructor adjusts the harness.

Gear checks needs time. Gear selected and adjusted in hurry might cause problems during the jump. For example deployment handle might not be at the same spot if harness has been adjusted or goggles are not tight enough and falls off. If first phase of gear checks are done well, it makes the rest of the checks easier and faster.

14.2 On the ground, before boarding

Second phase checks are done once we are geared up. Checks are done before boarding the plane. Second phase follows always following pattern:

- Gear is on and adjusted correctly.
- Handles are in place and visible. Check handles by touching them in the order that they would be used in emergency situation: Main parachute deployment handle -> Cutaway handle -> Reserve parachute deployment handle.
- Altimeter is visible and set to zero, hook knife is available.
- All other gear necessary during the jump is with you and in a correct place, such as helmet, goggles and gloves.
- All locks and buckles are closed and tightened correctly. Loose ends of straps are tucked away.
- AAD is on and adjusted correctly.
- Instructor or a friend checks that main- and reserve parachute flaps are closed. Pins are checked if flaps are opened after the first phase of checking.

Most common mistakes after gearing up happens with straps. Either chest buckle is routed incorrectly, straps are twisted or loose or ends are not tucked away correctly. Also altimeter setting might have changed, closing flaps opened, if you move in careless manner after gearing up. Helmet, goggles and gloves are easily forgotten, if not put on before second gear checks.

Student in a basic training is checked by an instructor or a coach, however at this point, you should be able to perform these checks by yourself.

14.3 Before exit

Checks done in the plane before exit starts the skydive. Checks are started depending on speed of the plane 500–1000m before planned exit altitude. Checks are brief and only necessary adjustments are done. Moving around the plane and setting up to the door should always be done with caution and by protecting your gear.

Good routine for checks is 3x3 check:

1. Check that three buckles are closed and tightened:
   - Left leg buckle.
   - Right left buckle.
   - Chest strap buckle.

2. Check that three handles are found and secured (always check in order that they would be used in):
   - Main handle.
   - Cutaway handle.
   - Reserve handle.
3. Check that:
   - 3-ring release system (both sides) and RSL is set correctly.

Also either instructor, coach or friend checks that main- and reserve parachute flaps are closed. Pin is checked if flap has opened. Pin that is under a velcro flap is good to check every time.

Before exit altimeter is checked, goggles are on and helmet is buckled.

Gear check before exit during poorly planned skydive might be skipped completely. Braking routine brings a bad feeling and more often than not, actual skydive is not successful if skydiver is not mentally ready.

Independent gear check is required always from this point forward, even though instructor or coach oversees gear checks done by a student.

While in the plane, observe also other skydivers gear. If you notice something well before exit altitude that usually prevents dangerous situations.

14.4 Rental gear

Towards the end of your student career there might be a situation where you use something else than student gear provided by your dropzone. For example when looking for a new gear you might be able to jump test jumps with a gear that is not familiar to you. Using other than student gear always requires approval by a chief- or assistant chief instructor that is written in your logbook.

Jumping rental gear has risks always. No one can learn all the deployment systems to a level of automation, so it is important to always pay attention to your deployment when jumping rental gear. This is a reason that usually the skill level on a skydiver who is using rental gear is lower. While jumping with a rental gear it is always important to get to know the gear. For example bottom of the container might be tighter. Poor preparation for a skydive with rental gear is often partially the reason for accidents.

For the first jump with rental gear should not be planned anything else than getting familiar with the gear. It is good idea to jump a canopy jump and deploy higher than normally. These points are rules during student career. Even during a freefall you can start finding for example deployment handle by making practice pulls before deployment altitude.

Own gear brings confidence. Maintaining is also easier since you always know your own gear better than rental ones.

15a AFF Basic training jumps

15a.1 8”

15a.1.1 Actions by the student

Use skills already learned. Straight floating exit, stabilize your body after the exit, maintain altitude awareness and stable body position.

15a.1.2 Learning objectives

1. Maintain stable body position before deployment, during deployment and after deployment.
2. Start deployment at correct and pre-planned altitude.

15a.1.3 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15a.1.4 Dive flow

ARCH

- Exit and arch right after entering the airflow.

One-one-thousand, two-one-thousand, three-one-thousand, ...

- Maintain your time awareness by counting.
- Relax.
- Maintain altitude awareness.

1300m

- Start deployment.
- Show deployment signal.
- Maintain good arch and basic body position.

REACH

- Bring your left hand in front of your face as a continuous part of your body and right hand to the pilot chute, take a good grip.

PULL

- Throw the pilot chute out.
- Return to the basic body position.

One-one-thousand

- Start counting right after you throw your pilot chute.
- Maintain good body position throughout the deployment.

Two-one-thousand…Four-one-thousand

- Canopy is deploying. If necessary, solve.

Five-one-thousand

- Peek over your shoulder if necessary (remove turbulence).

15a.2 5”

15a.2.1 Actions by the student

Use skills already learned. Straight floating exit, stabilize your body after the exit, maintain altitude awareness and stable body position.

15a.2.2 Learning objectives

- Maintain stable body position before deployment, during deployment and after deployment.
- Start deployment at correct and pre-planned altitude.

15a.2.3 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15a.2.4 Dive flow

ARCH

- Exit and arch right after entering the airflow.

One-one thousand, two-one thousand

- Maintain your time awareness by counting.

ARCH (three-one thousand)

- Start deployment.
- Show deployment signal.
- Maintain good arch and basic body position.

REACH (four-one thousand)

- Bring your left hand in front of your face as a continuous part of your body and right hand to the pilot chute, take a good grip.

PULL (five-one thousand)

- Throw the pilot chute out.
- Return to the basic body position.

One-one thousand

- Start counting right after you throw your pilot chute.
- Maintain good body position throughout the deployment.

Two-one thousand…Four-one thousand

- Canopy is deploying. If necessary, solve.

Five-one thousand

- Peek over your shoulder if necessary (remove turbulence).

15a.3 Back fly

During back flying (10.3) chest mounted altimeter might not show correct reading.

15a.3.1 Learning objectives

1. Transition from basic body position to back fly position.
2. Body control while back flying (small turning ok, flat spin is not).
3. Return back to basic body position.

15a.3.2 During the flight

1. Go through the jump in your mind.
2. Focus.
3. 3x3 check before jump (2.6).

15a.3.3 Dive flow

ARCH

- Exit the plane and arch to the relative wind.
- Relax your body position right after the exit.
- First take a basic body position and then transition to back fly body position.
- After 4 seconds return to basic body position.
- If there is enough altitude, repeat.

1800m

- Stop exercises and start preparing for the deployment.

1300m

- Start deployment.

15a.4 Tracking

The goal of tracking is to move as much as possible horizontally away from other skydivers while you are dropping vertically. Rate of descent might get higher while tracking. Altitude awareness is important, since also stopping the track takes time. Deployment while tracking is not suggested.

Good track is one of the most important skills skydiver has, since good tracking is the only way to ensure enough separation to other skydivers in the group.

Tracking is described with more detail in chapter 10.7.

15a.4.1 Actions by the student

- Figure out a direction of the jump run so you can pick a correct direction to track (away from the jumprun).

15a.4.2 Learning objectives

1. Track to pre-defined direction and heading control.
2. Tracking moves forward.
3. Tracking does not waddle.

15a.4.3 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15a.4.4 Dive flow

ARCH

- Exit the plane and take a good arch.
- Relax.
- Turn towards the direction of tracking, take a tracking body position and track for 5 seconds.
- Stop the track.
- If there is enough altitude, turn 180 degrees and repeat.

1600m

- Stop working and prepare for deployment.

1300m

- Start deployment

15a.5 FS-track

FS-track is series of actions performed after each group skydive. Signals shown during the series of actions is used to inform other skydivers what actions are coming next.

15a.5.1 Actions by the student

FS-track has following parts:

1. Altitude check.
2. Break-off signal.
3. Turn 180 degrees.
4. 4 second track.
5. Check surroundings.
6. Deployment signal.
7. Practice pull.

15a.5.2 Learning objectives

1. All FS-track maneuvers and checks done.
2. Track moves forward.
3. Turn is 180 degrees and track heading control is good.

15a.5.3 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15a.5.4 Dive flow

ARCH

- Exit and take a good arch.
- Relax.
- Take a fixed point for horizon and start FS-track.
- Do the series and end with practice pull.
- Check altitude.
- If there is enough altitude, repeat.

1600m

- Stop working and prepare for deployment.

1300m

- Start deployment.

15b Static line basic training jumps

15b.1 15”

Deployment is started at 1300m. Freefall is about 15 seconds. From this point on, add deployment signal to your deployment where you show to others you are going to deploy by swinging your arms across in front of your head.

15b.1.1 Learning objectives

1. Stable body position
2. Hand deployed (HD) pilot chute correctly thrown in to the airflow (if it is used during this jump).

15b.1.2 During the flight

1. Go through the jump in your mind.
2. Focus.
3. 3x3 check before jump (2.6).

15b.1.3 Dive flow

ARCH

- Exit and take a proper arch.
- Relax.
- Check your altitude.

1300m

- Start your deployment procedures.

ARCH

- Make sure you have a good body position.

REACH

- Bring left arm in front of you as continuous part of your body. Right arm goes to deployment handle (HD: pilot chute handle), take a firm grip.

PULL

- Pull handle to the direction of the cable cover or pouch. HD: Pull pilot chute out from bottom of container and throw it away from your body to free airflow.
- Return back to basic body position.

One-one-thousand

- Start counting right after deployment.

Two-one-thousand ... Four-one-thousand

- Canopy is deploying. If necessary, solve.

Five-one-thousand

- Peek over your shoulder if necessary (remove turbulence).

15b.2 Floating exit

Strut-plane (9.2.1)

Goal is to learn exit straight from standing on the step, without dropping to hang from the strut.

1. Climb outside of the plane, be careful with your gear, place both legs to the step and hands on the strut.
2. Left leg on the step and right leg on the airflow.
3. Look forward and keep chest presented to the relative wind.
4. Launch backwards to the direction of the relative wind.
5. Arch, look up, legs almost completely straight, arms back to delta position.
6. When body is turning to horizontal orientation, take a basic body position (10.1).

Other planes (9.2.2)

1. Move to the door and take a position your coach or instructor has given to you. Be careful while moving and protect your harness.
2. Launch forwards in to the relative wind, chest presented to the direction of flight.
3. Arch, legs almost completely straight, arms back to delta position.
4. While body is turning to horizontal orientation, take a basic body position.

15b.2.1 Learning objectives

1. Stable body position within 5 seconds after exit.
2. Heading control, no uncontrolled turning more than 360 degrees.

15b.2.2 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.2.3 Dive flow

ARCH

- Exit the plane and take a good delta body position once you’re in airflow.
- When body turns in to horizontal orientation, take a basic body position (usually within 5 seconds).

1300m

- Start deployment.

15b.3 Diving exit

Dive out from the plane and maintain heading.

Strut plane (9.3.1)

1. Right leg on the step.
2. Take a grip from the strut with your left hand, keep right hand in the airflow (or elbow on top of right knee).
3. Lift outwards (be careful with your harness).
4. Launch in a basic body position towards the wingtip, chest presented to the relative wind.
5. Body turns to horizontal orientation typically within 5 seconds.

Other planes (9.3.2)

1. Move to the door (be careful with your harness) and take a position your instructor or coach has given you.
2. Launch in a basic body position towards the wingtip, chest presented to the relative wind.
3. Body turns to horizontal orientation typically within 5 seconds.

15b.3.1 Learning objectives

1. Stable body position within 5 seconds.
2. Heading control, no uncontrolled turning more than 360 degrees.

15b.3.2 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.3.3 Dive flow

ARCH

- Perform diving exit.
- Keep symmetrical body position.
- Check your altitude.

1300m

- Start deployment.

15b.4 360 degree turns

After the exit perform a controlled 360 degree turn (10.2).

Perform the turn as described in chapter 10.2.

Maintain arch throughout the turn, check your altitude.

15b.4.1 Learning objectives

1. 360 degree turn to pre-defined direction and controlled stop.
2. Body position remains stable.

15b.4.2 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.4.3 Dive flow

ARCH

- Exit the plane.
- After your body turns to horizontal body position (usually within 5 seconds), take a relaxed basic body position (10.1)
- Take a fixed point from the ground/horizon and perform 360 degree turn to a pre-defined direction.
- Check your altitude and repeat if there is enough altitude.

1600m

- Stop and prepare for deployment.

1300m

- Start deployment

15b.5 Back fly

During back flying (10.3) chest mounted altimeter might not show correct reading.

15b.5.1 Learning objectives

1. Transition from basic body position to back fly position.
2. Body control while back flying (small turning ok, flat spin is not).
3. Return back to basic body position.

15b.5.2 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.5.3 Dive flow

ARCH

- Exit the plane and arch to the relative wind.
- Relax your body position right after the exit.
- First take a basic body position and then transition to back fly body position.
- After 4 seconds return to basic body position.
- If there is enough altitude, repeat.

1800m

- Stop exercises and start preparing for the deployment.

1300m

- Start deployment.

15b.6 Barrel roll and backflip

In a barrel roll your body is turning from belly to earth orientation completely around over your side.

Barrel roll is done like chapter 10.5 describes.

Back flip you perform a flip backwards.

Back flip is done like chapter 10.6 describes.

15b.6.1 Learning objectives

- Control of your body position is regained after the maneuvers.

15b.6.2 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.6.3 Dive flow

ARCH

- Exit.
- After body position is turned to horizontal orientation (usually within 5 seconds), take basic body position (10.1).
- Make a barrel roll.
- Check altitude.
- Make a back flip.
- Check altitude.
- If there is enough altitude, repeat.

1800m

- Stop and prepare for deployment.

1300m

- Start deployment.

15b.7 Tracking

The goal of tracking is to move as much as possible horizontally away from other skydivers while you are dropping vertically. Rate of descent might get higher while tracking. Altitude awareness is important, since also stopping the track takes time. Deployment while tracking is not suggested. Good track is one of the most important skills skydiver has, since good tracking is the only way to ensure enough separation to other skydivers in the group.

Tracking is described with more detail in chapter 10.7.

15b.7.1 Actions by the student

- Figure out a direction of the jump run so you can pick a correct direction to track (away from the jumprun).

15b.7.2 Learning objectives

1. Track to pre-defined direction and heading control.
2. Tracking moves forward.
3. Tracking does not waddle.

15b.7.3 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.7.4 Dive flow

ARCH

- Exit the plane and take a good arch.
- Relax.
- Turn towards the direction of tracking, take a tracking body position and track for 5 seconds.
- Stop the track.
- If there is enough altitude, turn 180 degrees and repeat.

1600m

- Stop working and prepare for deployment.

1300m

- Start deployment

15b.8 FS-track

FS-track is series of actions performed after each group skydive. Signals shown during the series of actions is used to inform other skydivers what actions are coming next.

15b.8.1 Actions by the student

FS-track has following parts:

1. Altitude check.
2. Break-off signal.
3. Turn 180 degrees.
4. 4 second track.
5. Stop and Check surroundings.
6. Deployment signal.
7. Practice pull.

15b.8.2 Learning objectives

1. All FS-track maneuvers and checks done.
2. Track moves forward.
3. Turn is 180 degrees and track heading control is good.

15b.8.3 During the flight

- Go through the jump in your mind.
- Focus.
- 3x3 check before jump (2.6).

15b.8.4 Dive flow

ARCH

- Exit and take a good arch.
- Relax.
- Take a fixed point for horizon and start FS-track.
- Do the series and end with practice pull.
- Check altitude.
- If there is enough altitude, repeat.

1600m

- Stop working and prepare for deployment.

1300m

- Start deployment.

PART III – ADVANCED TRAINING

16 Advanced training program

At this point you are independent student. You don't necessarily need an instructor or a coach with you in the plane, he/she can supervise your jump from the ground or from the plane. You are learning different disciplines, such as formation skydiving and free flying. You are learning to fly a parachute with different canopy jumps and you will continue practicing your landing accuracy. You are also permitted to use other than student gear provided by your club with either chief instructors or assistant chief instructors permission. The main goal is to learn fundamentals of safe group skydiving and safe canopy handling.

16.1 Advanced training jump program

Jumps can be performed in order that instructor or coach decides.

- 3 Canopy handling jumps (17). When student receives a permission to use own gear or is using a gear that is not designed for student skydiving, canopy handling jumps are jumped in a row before next jumps. If possible, canopy handling jumps should be jumped at early phases of advanced training and continue to learn same skills on all other advanced training jumps, and naturally even after the student program.
- 5 group skydives (18 and with some preconditions 19).
- Optional jumps, AFF 2 jumps and SL 5 jumps. You can try also free flying if not already done during group skydives (19) or instructor or coach chooses jumps that are appropriate for students needs and progression level. Each jump should include learning objective, filling jumps should not be done.
- Check dive (28.4).

16.2 Other tasks

- 5 exit spot determinations and accuracy landings within 50m radius from a point given by instructor or coach.
- Most important things to practice under a canopy on top of things already learned:
    - Turning by using rear risers.
    - Observing altitude loss while turning.
    - Controlled crosswind landing.
- Practical exam on packing and checking a student main parachute.
- A-license theory exam. Exam covers all previously learned things and rules and regulations regarding skydiving activities in Finland.

16.3 Time limits

If during advanced training student has 30 day or more than 30 day break between jumps, he/she has to jump 15" jump as a recurrency before continuing in a normal progression. Instructor or coach can require additional tasks in case of long break.

17 Canopy handling jumps

Keywords: *Flying in traffic, avoidance rules, landing order, planned patterns and final approach, landing accuracy*.

During advanced training you must be prepared to find yourself in canopy traffic on every jump. Airspace checks and preparation for avoiding collisions must become a routine at this point. Airspace checks and preparation to avoid collisions are not any more just exercises, they are your responsibility now as much it is others.

Learn also rest of the avoidance rules by heart (avoid slower canopies, tandems, reserve parachutes). You should also be able to let others land before you by holding should also be routine at this point and you know how to respect and work with other canopies. Learn how to plan landing order already in higher altitude, where holding and altitude burning is much easier to gain enough separation to other canopies for a good landing order before landing pattern, where it is much harder to do.

There is no more excuses not to respect landing pattern and landing direction within traffic. If you cannot land by using planned landing pattern, you must land away from other canopies. However you must remember landing priorities!

Develop your pattern accuracy. While planning the jump your instructor or coach might not give pattern points to you anymore, they just make sure your plan is safe with the rest of the load. At this point you must be able to plan your pattern in a way that you can land close to your planned landing spot, and if necessary and safe, to adjust your plan according to the situation under the canopy. Remember that safety is more important than accuracy! You are not allowed to make s-turns or low turns in a landing pattern.

Learn to land well in to a small crosswind. This might require steering all the way down to the ground and even asymmetric flare.

Exercise

Skills listed above should be practiced on all jumps. There are also signature required fields in your logbook:

- Turns by using rear risers.
- Observing loss of altitude while turning.
- Controlled landing to crosswind.

17.1 Things to be considered

While flying with faster canopies is much like flying with an airplane. They have performance and qualities that makes flying fun, but they also have qualities that makes them dangerous if not handled correctly. You must understand features of the canopy in order to fly them safely in conditions that manufacturer and rules have for skydiving activities. Border conditions and maximum steering does not combine well.

Border conditions and things to avoid are:

- High wind, especially gusty and turbulent weather.
- Flying in a burble that forms behind another canopy.
- Small landing areas.
- Tired jumper.
- Taking unnecessary risks.

17.1.1 Free fall

- Jump at a correct exit spot.
- Check your position already during freefall.
- Break-off at correct altitude and high enough depending on your level and the jump plan.
- Track away from others, check the airspace and give deployment signal.

17.1.2 During deployment

- Deploy high enough, stable body position, look to the horizon and shoulders level with the horizon. Do not look over your shoulder to the pilot chute. As soon as the canopy deploys, you must check the airspace in case there is others nearby.
- Make decision: FLIES/DOES NOT FLY (à emergency procedures).
- Put your hands to the rear risers and turn away from the jumprun.
- Check your location and altitude, locate others.
- Check your cutaway handle and reserve deployment handle location and attachment.
- Turn by using your rear risers to the desired direction.
- Collapse slider and release brakes.
- Perform steering tests (at latest at 600m altitude).

17.1.3 Flying

- Eye contact 90% around (flight direction, sides, down, up and back) and 10% to the ground.
- Give others space to fly, do not go too close if not planned in advance.
- Plan the traffic and landing order by holding while higher altitude, not in landing pattern.
- Notice rules for avoiding. Reserves, slower canopies and canopies below you.
- Steer the canopy calmly and feel the weather, for example during turbulence, fly with full flight position.
- If necessary, decide on your reserve landing area with enough altitude. Decide also landing direction to your reserve landing area.
- Observe your altimeter and loss of altitude during maneuvers.

17.1.4 About collisions

New materials used as lines in canopies combined with modern canopies and speeds they can gather will cause big damages when hit or tangled around a skydiver. These line materials are used in almost every faster canopy.

While colliding with a canopy using these lines it is suggested to curl in to a ball, this is the most sufficient way to avoid entanglement with the lines and you might even go straight through between the lines.

Try to avoid collision by turning to the right and warn the other party by yelling. If however collision can't be avoided, follow these steps:

- Minimize the speed by braking hard.
- Curl in to a ball.
- Protect your cutaway- and reserve handles.
- If canopies get tangled:
    - Check your altitude.
    - Discuss with the other party about the actions order.
    - Make sure you are clear from the lines (if necessary, use your hook knife) before performing emergency procedures.
- It is not safe for two people to land with one heavily loaded canopy.

17.1.5 Landing

- Follow landing rules: direction of the pattern, obstacles and restrictions.
- Observe surroundings, wind and ground.
- Plan the landing pattern with enough time. Take in to account obstacles, people, traffic, turbulence and wind.
- No steep turns.
- Select landing area (short, wide) according to your skills.
- Do not force yourself to one specific spot, land calmly and safely.
- Perform good two-staged flare (51.1). Canopy does not allow asymmetry.

Instead of head wind you can land to any direction, if you notice in your final you are flying to a wrong direction. Most important thing is to land to a clear area without performing steep turns in your final approach.

- Keep direction by steering all the way to the ground, do not reach with your arm or leg.
- Do not pump your toggles during final approach.
- If you flare too high, keep your toggles down or release them only slightly. Keep your legs close together.
- Observe your altitude (from surroundings, not your altimeter), since flaring depends on observations.

17.1.6 After landing

- Collapse your canopy by pulling one toggle down and releasing another.
- Check your behind, there might be other canopies landing.
- Put toggles to their place in risers.
- Gather the canopy and move away from the landing area.
- Observe other canopies and traffic still.

Going through the program requires good weather conditions also above 600m altitude, so turns, stall practices and so on can be performed safely and not drift away from the area. Below 600m start preparations for landing pattern. After that, do not steer aggressively, because canopy might have a malfunction for example lineover (first picture of malfunctions in chapter 4.3) or line twists. Closer to the ground there is little time to solve the canopy.

Canopy jump program is part of the advanced training. During canopy handling jumps there is no freefall tasks.

When student receives a permission to use own gear or canopy that is not designed for early stages for student program, canopy handling jumps are done before other jumps.

Canopy handling jumps should be done at the beginning of advanced training if possible and practice skills learned on them during rest of the jumps.

Brief description of the program can be found in attachment 3.

17.2 Canopy handling jump 1

Goal is that you learn the features of your canopy and you learn to perform correct two-staged flare.

Exit altitude is at least 2000m. Deploy after about 5 seconds. Remember club- and airport specific things regarding deployment altitude.

Before releasing the toggles, check your airspace and try steering from the rear risers. Make at least two 90 degree and 180 degree turns both directions. This is a way to practice avoiding collisions right after deployment.

Release the brakes and find the stall point on your canopy by slowly adding more and more brakes. If canopy does stall, lift toggles slowly and symmetrically. If there is enough altitude (over 1000m) left, practice this 2-4 times.

After this practice flaring from full flight position. Remember sharp first stage and then slowly apply more brakes to keep the canopy flying horizontally. During the first stage notice the G-forces getting higher and canopy transferring to horizontal flight.

Prepare for the landing pattern and respect the landing order. Perform correct flare from full flight position. If you did not land where you wanted, think about why and discuss with your instructor how you could fly the pattern differently (for example different starting point, earlier turn to the final and so on).

17.3 Canopy handling jump 2

Goal is to learn to fly half- and full brake positions.

Exit altitude is at least 2000m. Deploy after about 5 seconds. Remember club- and airport specific things regarding deployment altitude.

Before releasing the toggles, check your airspace and try steering from the rear risers. Make at least two 90 degree and 180 degree turns both directions.

Release the brakes. Brake to a half-brake position (toggles on your shoulder level). In this position try at least two different turns (90, 180, 360 degrees to both directions) both by pulling one toggle down and by lifting one toggle up. During the whole exercise fly in half-brake position and do not release the canopy in to a full-flight position.

Brake to a full-brake position (toggles on your waist level). In this position try at least two different turns (90, 180, 360 degrees to both directions) by lifting the opposite toggle up. During the whole exercise fly in full-brake position.

After these if altitude allows (more than 700m), try 2–4 times flare from a full-flight position.

Prepare for the landing pattern and respect the landing order. Perform correct flare from full flight position. If you did not land where you wanted, think about why and discuss with your instructor how you could fly the pattern differently (for example different starting point, earlier turn to the final and so on).

17.4 Canopy handling jump 3

The goal is to learn how much altitude you lose with different kind of turns.

Exit altitude and freefall is the same than during previous jumps.

Before releasing the toggles, check your airspace and try steering from the rear risers. Make at least two 90 degree and 180 degree turns both directions.

Release the brakes and check airspace and altitude. Try one calm and one quicker 90 degree turn from full-flight position and check your altitude after each turn and observe how much it did drop. Notice the airspeed getting higher compared to a student canopy. Try the same with 180 degree turns.

Check airspace and altitude. Try quick 360 turn and stopping to a pre-defined direction. Notice how airspeed gets higher and altitude drops more quickly. Notice how much earlier the turning must be stopped so the canopy will stop turning to a correct direction and how big of a counter action it requires to stop the turn. Observe the loss of altitude while turning and try the same with calm 360 degree turn.

After these if altitude allows (more than 700m), try 2–4 times flare from a full-flight position.

Prepare for the landing pattern and respect the landing order. Perform correct flare from full flight position. If you did not land where you wanted, think about why and discuss with your instructor how you could fly the pattern differently (for example different starting point, earlier turn to the final and so on).

17.5 Exercise

1. Read Skydivers Guide canopy section (Part V) and related rules and regulations and announcements.
2. Practice and recap on the ground and/or with training harness the exercises done during canopy handling jumps.
3. Show in a training harness your actions after the deployment and actions in case of collision.

18 FS-Jumping

Advanced training FS (formation skydiving) program includes 9 jumps and techniques related to them. According to a student program student must jump at least 5 group skydives. There is opportunity to jump even more if also optional jumps are used for group skydives. Purpose of the program is to advance in the program only when previous objectives are done. All jumps are practiced on the ground both standing up and with FS boards, so freefall time is spent in a most efficient way.

18.1 Safety

There are a lot of things to consider regarding safety, because there are multiple jumpers close to each other. In the plane observing another jumpers gear is part of it. During the exit it is important where you take a grip, so you don't accidentally grab for example a reserve handle. Exit must always be planned and practiced either at the plane or a mock-up. If exit is not successful, each jumper must be aware of their next actions, these must be pre-planned.

During the freefall there is a possibility to drift over or under another skydiver. Collisions might at times be even hard, and that is why a hard helmet should always be worn during group skydiving. Later on maneuvers done even on purpose might be so aggressive that helmet is useful protection against for example other jumpers leg.

Responsibility of altitude awareness and break-off is on every jumper in the group. During student FS jumps the break-off altitude must be at least 1600m and during the first jump at least 1800m. Break-off at correct altitude is students task. Break-off signal is shown clearly, after that student turns and tracks away to a free airspace. It is important to learn good track from the beginning, since it lowers the risk of collision and raises the safety.

Airspace over and under must be checked and deployment signal must be shown before every deployment.

When jumping in a group, you must always be prepared to avoid others right after the deployment by bringing your hands to your rear risers right after the deployment.

When there is a lot of traffic under canopy, it is important to fly calmly and predictably under the canopy and sudden maneuvers might cause harm to others.

18.2 Eye contact

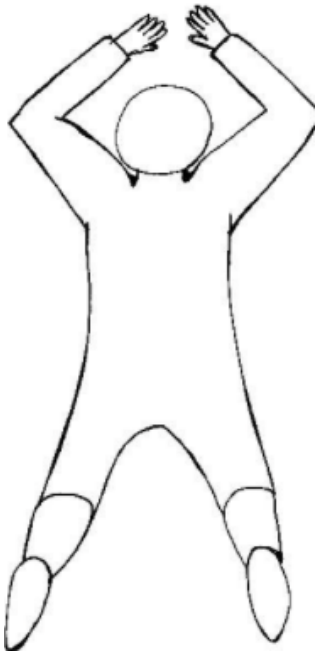
The most important basics in FS jumping is eye contact. Only way to communicate in the air is by eye contact.

Eye contact also offers a reference point. Most common reason for separation among the group is not using a reference point in the middle of the formation, since your body actively tries to move to the direction of your sight.

18.3 Basic body position

All maneuvers are started from a basic body position, look a picture in 10.1.

Also we can use newer, more sufficient position called a diamond position (picture 18.1), if students and coaches skill permits. this position gives better pressure to upper body, when starting and stopping all maneuvers are more effective. During group skydiving this also helps when taking grips, since your hands are already closer. Altitude awareness is also improved, since altimeter is better in sight.



18.1. Diamond from the top.

18.4 Moving horizontally

Moving forward is done by extending your legs.

18.2. Moving forward.

Moving backwards is done by extending arms and simultaneously pulling your legs inwards.

18.3. Moving backwards.

18.5 Moving upwards and downwards

Up- and downward motion is used to stay at the same level with other jumpers within the group. Eye contact should be maintained at all times. Vertical movement is done by adding arch (downwards) or removing arch and extending arms and legs (upwards), that is also called “cupping”, even though body position should not be turned to a negative arch.

18.4. Movement upwards.

18.5. Movement downwards.

18.6 Turns

Turning in place is based on a movement done in arms and legs simultaneously. Center body stays in a straight line throughout the turn. Turning is done by pressing one side arm and opposite side

leg down. Stopping the turn requires quick and efficient counter action and returning to a basic body position. By using more arms than legs we achieve a turn over your knees. By using more legs than arms we achieve a turn over the upper body.

18.7 Moving to the side

Movement to the side we press same side arm and leg down towards the movement. Stopping the movement requires a counter action and returning to a basic body position.

18.8 Taking grips and flying in a formation

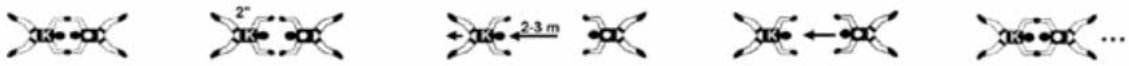
While taking grips you should always be at the same level than the skydiver you are taking grips with. Grips are taken either from wrists or jump suit grips. Grip should be firm, but there should not be pulling. Grip is for finalizing/gathering a formation, this means that it is brief stopping before breaking off the formation and moving towards the next formation. You should not hold on to a grips with force, instead you should always fly your slot actively and be prepared to move to next formation.

18.9 Jump program

FS-program contains nine jumps and plans. Instructor or coach chooses most appropriate jump for the situation. You can find FS-program also from the attachment 1 in this guide.

18.9.1 Jump 1: Moving forward

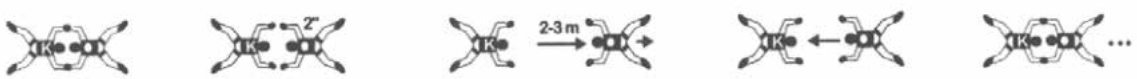
After the exit relax, take a basic body position and turn towards your partner. Fly forwards to your partner, take a wrist grip and basic body position, check altitude and fly your slot. After the partner gives you a signal, release the grip. Partner waits for couple of seconds and moves slightly backwards. Repeat movement forward.



18.6. FS-jump 1.

18.9.2 Jump 2: Movement forward and backward

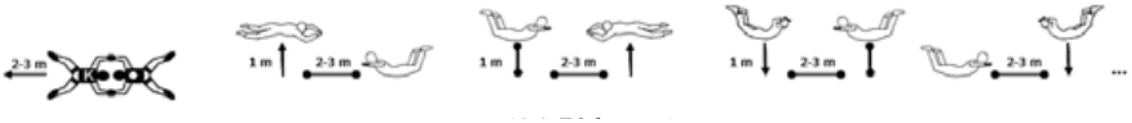
After the exit relax, take basic body position and turn to face your partner. Fly to your partner and take a grip from the wrists. Fly your slot correctly. Check the altitude and release the grip once there is no pulling. Wait for couple of seconds and move couple of meters backwards. Repeat.



18.7. FS-jump 2.

18.9.3 Jump 3: Movement upwards and downwards

Fly to your partner and take a grip. Check the altitude and fly your slot. Partner gives a signal to release and then uses “cupping” to move slightly upwards. Reduce the arch and move up to your partner. Partner then arches and moves slightly down. Add arch and move to same level with your partner. Don’t take grips after the first release. Partner keeps a distance in a way that even when pushing your head against the airflow you can still maintain eye contact. Keep symmetrical body position. Repeat.



18.8. FS-jump 3.

18.9.4 Jump 4: Vertical movement combined with movement forward

Fly to your partner and take a grip. Partner moves slightly backwards and upwards. Reduce arch, fly forwards to your partner and take a grip. Fly your spot. Partner moves slightly backwards and downwards. Arch and move to your partner, take a grip and fly your slot. When moving, always try to move to the same level before moving forwards. Maintain eye contact. Repeat.

18.9. Jump 4.

18.9.5 Jump 5: 90 degree turn

While turning, keep your partner as a point of reference. Turns are done from a half star to an open accordion and back to half star. Fly to your partner and take a grip. Partner gives a signal, release your left hand grip and formation is opened 90 degrees to a half star. When there is no pull on the formation, give a signal. After the release wait for a second before starting the turn. Turn 90 degrees to right and take a grip with your left hand (open accordion). Give a signal and turn back to half star. Make sure that you are on a same level than your partner when taking grips. While moving between formations, remember to turn first and take a grip after the movement has stopped. When taking grips make sure it is light and fly your slot. Do not pull your partner. Repeat.

18.10. Jump 5.

18.9.6 Jump 6: 180 degree turn

Fly to your partner and take a grip. Turn 90 degrees right and stop without any grips in a sidebody-formation. Maintain distance and angle for a while and turn 180 degrees to the left to a opposite sidebody-formation while keeping your partner as a reference. Maintain distance and angle for 2 seconds. Stop between turns so you can focus and observe that turns are not going over 180 degrees. If drifting away from your partner, turn right away towards your partner and continue turns to another direction. Repeat.

18.11. Jump 6.

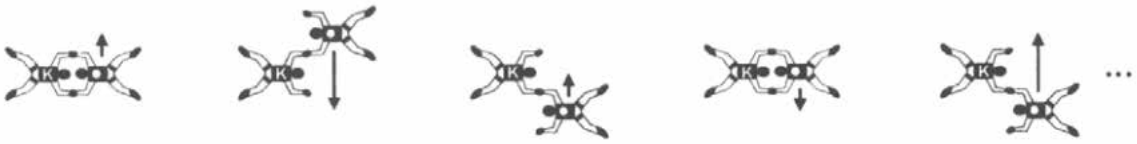
18.9.7 Jump 7: 360 degree turn

Fly to your partner, take a grip. After partner gives you a signal turn 360 degrees to the right. Use arms and legs to turn. Remember a symmetrical basic body position, start-coast-stop and take a grip. Turn 360 degrees to the left. Be patient before starting a new turn so that the formation is over before starting the turn. Remember to maintain levels. Remember to start stopping the turn before it is done, so it will not turn more than planned. Repeat.

18.12. Jump 7.

18.9.8 Jump 8: Movement sideways

Start in a star and move sideways to an open accordion. Then move to another side open accordion. And back to star. Fly to your partner and take grips. Move right, stop and take a grip. Move left, stop and take a grip. Repeat.



18.13. Jump 8.

18.9.9 Jump 9: Approach sideways

Start movement in front of your partner and turn 90 degrees to the right and after that move sideways towards your partner so he/she can take a grip. After this partner gives a signal and releases grips. Fly to your partner and take a grip. Turn 90 to the left and move sideways towards your partner. Remember to use your whole body to move sideways. Try to perform turns calmly to avoid turning over. Repeat.

18.14. Jump 9.

19 Freeflying

Freefly jumps goal is to get introduction to fundamentals of freeflying. These jumps are not necessarily to teach any specific body position, but to introduce student to fly with different body positions and to learn control their body in other positions than basic body position and to return from a surprising body position back to stable basic body position.

First phase in learning freeflying is to learn to fly on your belly, then on your back. Back flying is a base for all freeflying. When you can control your flying on your back, you can start practicing other positions. Also your rate of descend on your back is similar to other body positions. During freeflying if you lose control of your body position, always recover to your back. This way you maintain your speed and avoid high speed collisions.

Freeflying can be divided to following main categories: Head-up, head-down, angle and dynamic. Head-up flying means all flying that happens with a head up orientation. Head-up body positions are for example back flying, sitfly, stand-up, knee flying, daffy and so on. Head-down flying means all flying that happens with head down orientation, such as shelf and daffy. Angle flying is free flying that moves horizontally. Angle can be done in head-down or head-up orientation. You can angle on your back or on your belly. Difficulty level can be adjusted by for example adding more angle or speed. Angle flying should be started as a flatter tracking at first. Back flying exercises helps also with angle flying on your back. Tracking and back flying you can practice with your optional jumps in your student program. Dynamic flying combines all of these categories. In dynamic flying there are flashing combinations of movement where orientation changes constantly. Dynamic flying in the sky is still relatively new discipline but is transferring from a wind tunnel to skydiving. Even though dynamic flying is underlining variety in freeflying, none of the freeflying categories are forced to a one orientation or body position. While jumping with others, you need to constantly change your body position to match your speed to others.

19.1 Head-up practicing

As a student, head-up is started from a back flying, from there the progress goes to transitioning upwards and then sitflying. Back flying body position is actually the same than sitflying body position, but just in a different orientation.

While talking about flying on your back we also talk about ball position / recovery position. Recovery position means body position where you should transition if you lose control while flying free, for example head-up or stand-up in order to maintain same speed than the rest of the group.

In recovery position jumper curls partially in a ball like body position, this means that legs are pulled in and arms are bent 90 degrees forward, so the orientation turns more on the back and jumpers bottom is falling straight to the ground. This position maintains your speed better, since in most freeflying body positions the speed is much higher than on belly to earth position. This position adds safety when jumping in a group. If jumper turns straight to basic body position on their belly, their speed reduces dramatically compared to other jumpers in a group and that might lead to collisions. Find more in a freeflying section of this guide in chapter 42.7.2.

From recovery position you move back up to sitting position as follows:

- Add lift to your upper body by:
  - keeping your arms in 90 degree angles from your body and from your elbows.
  - Press your arms and back of your palms against the airflow.
  - Press the back of your head against the airflow.
  - Open your chest and press your shoulders backwards, this bends your back.
- These actions causes the airflow to lift your upper body upwards. Once it does, you can quickly bring your feet close to your bottom, this removes lift from your legs and makes it possible to raise back to sitting position. After it rises, bring your legs back to sitting position 90 degrees bent from the pelvis and knees.

Challenges while raising back to sitting position are usually caused by lack of angle in your pelvis or that you try to get up by using your abs. Movement in your legs while getting up happens only below the knee. If you are straight from your pelvis, the position will turn over to your belly. From the recovery position it is not suggested to use your abs to raise up, since it will remove lift from your upper body, and the orientation will not change. Instead you should focus on getting the maximum surface area against the airflow by working with your back, chest and arms.

You move from sitting position down to a recovery position by curling your back, pressing your chin to your chest and by relaxing from arms and legs slightly, in order for them to stop supporting your sitting position. Try to keep this transition as controlled as possible, and body position as similar as possible to the sitting position. Then you can get back to sitting position from recovery position.

When this transition between sitting position and recovery position works, you can start working on your flying skills in head-up orientation, controlling the sitflying and moving while doing it. See more basic info on sitflying in the freeflying guide in chapter 41.2. You can also practice sitflying straight from the exit, just like in 41.2.1 describes.

19.2 Safety

Safety while performing freeflying jumps as a student includes for example following things:

- You must maintain altitude awareness, since in most freeflying body positions the speed is high.
- Stop working at latest in 1600m and get back to basic body position.
- While flying on your back or in sitting position chest mounted altimeter might not show correct readings. It is strongly suggested that an altimeter mounted in your hand is used.
- Work always facing away from the jumprun, most freeflying body positions drifts if done incorrectly, this way you don’t drift under or over other skydivers in other groups.
- While gearing up, make sure all long straps are secured.
- Make sure your clothes can’t get over your handles. Make sure that the pilot chute is securely tucked in the bottom of container.
- Sometimes while flying either on your back or in sitting position, your leg-straps might start sliding towards your knees. This can be avoided by using a rubber cord between your leg-straps. Ask for a rigger to install this cord if you don’t have one.
- Remember to plan the jump.

Head-down flying while using student gear is not allowed. Gear is not designed for it.

19.3 Jumps

Practice each jump according to the instructions given to you by your instructor or coach before the actual jump. Familiarize yourself with safety concerns regarding freeflying and take them in to account while planning the jump.

19.3.1 Jump 1: Back-sit-back transitions

Use exit that is familiar to you. Turn to your back and make sure you are stable before moving forward.

Goal of the jump is to maintain good and stable body position on your back, transition up to sitting position and back down. If you are able to get up to sitting position or if you lose control of it, get back down to your back and repeat the exercise.

Other things to take in to account:

- Altitude awareness in different body positions.
- Freefall time reduces since the speed is higher.
- Work across the jumprun.

19.3.2 Jump 2: Exit to sitting position

Goal of the jump is to maintain sitting position straight from the exit. Exit can be performed either belly or back towards the ground, so the relative wind comes from a right angle. From this point on, practice sitting position like in first jump. When you lose sitting position, get down on your back and lift yourself back up. If position feels controlled, you can stay in sitting position for a longer time.

19.3.3 Jump 3: Controlling sitting position

Goal is to stay in sitting position and prevent drifting. Check chapter 41.2.3.

Other things to take in to account:

- Work across the jumprun.
- It is usual that in the beginning your body drifts backwards because you are leaning slightly forward and you might not notice it.
- Focus from the beginning that you keep your chin up, shoulders back, chest open and press upper body backwards. This way the position stays in place, or if pressed enough backwards your position will move even forwards.

20 Transitioning to using own gear

Parachutes and their performance develops constantly. Student parachutes has been designed throughout the ages to be reliable and forgiving. In 1970s students jumped using elementary round canopies, 1980s students used performance canopies and more experienced jumpers used gliding canopies. In early 1990s student canopies became F-111 fabric and big and high profile canopies such as Manta and Raider. In late 1990s and early 2000s ZP-canopies with slightly elliptical design became to student skydiving such as Navigator and Skymaster. They are lighter to steer and they maintain their characteristics longer than their predecessors.

Canopies used by licensed skydivers has developed much faster than student canopies. Wing loads used are getting higher and canopy designs are progressing all the time. For many people transition from a student canopy to a so called normal canopy might be a big leap. It is important to remember that flying with a higher loaded canopy requires much more work and focus to a canopy practices.

Skydiver must be able to choose their canopy according to their skills, discipline and environment. Flying the canopy must be nice and safe for that individual and also for others. Also skydiver must understand all features and characteristics of their canopies in different conditions. This is why it is important to read part VI, canopy handling guide when transferring from student canopies forward.

20.1 Experience limits for canopies

Student in advanced training can get a permission to use their own gear from the chief instructor or assistant chief instructor. Finnish Aeronautical Association updates a lists where you can find out which canopies are suitable for:

- Early stages in student career.
- For advanced training students.
- Licensed skydivers.

Finnish Aeronautical Association has made a limits for wing loading (look a definition of wing loading in chapter 48) and experience:

- Early stages of student career ≤ 1.1lbs/ft²

While choosing the size and wing loading for a canopy you must also check Finnish Aeronautical Association Parachuting Committee table for wing loadings relation between the weight of the skydiver and size of the canopy. Also previous landings must be taken in to account.

Canopies used by licensed skydivers differs from student canopies:

- Smaller in size with bigger wing loading à Speed is grater both, forwards and downwards. Greater risk for malfunctions. Speed for stalling is higher -> Requires more precision and quicker reactions.
- Wing profile and shape brings higher performance à Better glide ratio, greater speed and more sensitive while turning.

- Thinner lines à deployment shock is harder, wears quicker and dangerous during collisions.
- Collapsible slider and pilot chute requires more precision while packing.

20.2 Other gear

AAD (Automatic activation device) is required for all students, A- and B-licensed skydivers. It is standard equipment for almost all new gear ordered to Finland. AAD usage is strongly suggested always.

With faster canopies it is possible to gather such speeds that are higher than the activation speed for AADs (for example Cypres 35m/s). AAD activation during a high performance landing is not possible without a high wing loading. AAD has saved thousands of skydivers around the globe. Finnish Aeronautical Association has made a list of AADs suitable for usage in Finland.

RSL (Reserve Static Line) means a system where a static line opens reserve canopy after the main canopy has been released from the harness. System joints main canopy riser and reserve canopy deployment system together. RSL is a system that might save life after for example accidentally low cutaway. RSL is required for all students, A- and B-licensed skydivers.

RSL can have an add-on called MARD (Main Assisted Reserve Deployment). MARD system has a RSL line that triggers the reserve canopy deployment system during a cutaway. On top of that in MARD, main canopy pulls reserve canopy deployment bag out of the container after a cutaway. This makes reserve canopy deployment much faster. If main canopy is still in the harness, reserve static line will not be activated and reserve canopy must be deployed by pulling the reserve deployment handle. MARD systems are different with each manufacturer, for example DRD, Reserve Boost, Skyhook, Air Anchor and Trap System. They might not be available for all harnesses. Reserve Static Line must be connected in order for the system to work.

20.1. MARD system can make reserve deployment quicker (UPT).

Using a helmet is required up until D-license. Even D-license skydivers usually wears a hard helmet.

Choosing a suitable helmet is depending on for example discipline. Open face helmet offers for example little bit wider vision, but full face helmet offers protection against damages to face and chin while colliding. When using full face helmet it needs to be noted, that visor might fog up at times. Opening and closing the visor should be practiced in advance. For example thicker gloves might make It harder to open the visor.

Most of skydivers uses hand mounted altimeter. Altimeter can be placed also to other places, such as chest, arm and leg. Most important thing is to use it in same place always and learn to read it in all orientations and under the canopy.

Many skydivers uses also audible altimeter. They usually have 2-3 adjustable alarms, that skydiver can adjust to desired altitudes. Some audible altimeters also gathers information about the jump, such as exit altitude, speed and deployment altitude.

Audible altimeters are really reliable and they are useful addition in almost every discipline in skydiving. However it is just an additional tool and you should always use also visual altimeter.

Altimeters in general are really reliable devices, but maintenance, fixing and possible change of battery guarantees a working altimeter. Altimeters should always be serviced by a professional.

Skydiving with a camera is more common after cameras are getting smaller and cheaper. Even with small size they still do cause a snag hazard and they take focus away from the jump itself. Additional risks brought by cameras are visible yearly in accident reports. Camera helmet should be as snag free as possible and it should have a cutaway system for releasing camera or the whole helmet easily by one hand. Jumping with a camera requires at least C-license, strong routine and good basic skills in freefall and under the canopy. Before jumping with a camera you should always discuss with more experienced jumpers or safety officer at the club about required gear and skills. Audible altimeter is strongly suggested while jumping with a camera.

Almost every discipline has dedicated and specially designed suits. FS-suits have grips for making formations easier and booties to bring more power to your legs and tracking. Freeflyers like suits that are suitable for all orientations. Regular pants with jacket or shirt as a jumpsuit is a bad idea, however if you still do it, make sure your jacket or shirt will not cover any of your handles in any orientation.

Skydiver can jump with different kind of additional gear, below is some info:

- Wingsuit: using a wingsuit requires D-license. Also A-, B- and C-license skydivers can use wingsuit if they have training certificate given by a wingsuit coach approved by Finnish Aeronautical Association or wingsuit manufacturer. While jumping with a wingsuit, experience requirements set by the manufacturer must be followed.
- Smoke, flags and streamers: During show jumps it might be required to use for example smoke to improve visibility for observers. While jumping with a flag or a streamer you should always check if it is a device that effects on your freefalling, and if it is, C-license is

required. Attaching these add-ons requires experience so always consult more experience skydivers. Using smoke requires also informing a pilot and air traffic controllers.

- Skysurf: Jumping with a board requires either C-license and tests by a safety officer to show that skydiver has required skills for jumping with a board or a D-license.
- Spaceball: Spaceball is a ball filled with weight is not allowed in Finland. Aviation law prohibits dropping anything from a plane that might cause harm to others.

20.3 Exercise

1. Perform evaluation on suitable wing loading. Choosing a canopy size and model and think about possible gear choices and their possible limitations.
2. Familiarize yourself with restrictions and limitations set by the Finnish Aeronautical Association.

21 Gear checking and maintenance

21.1 Checking and maintenance periods for skydiving equipment

Skydiving gear and automatic activation device must be checked, maintained, packed and installed according to the manual given by the manufacturer.

There is set periods for required maintenance. Periodical maintenance keeps skydiving gear safe for jumping. Maintenance periods are set in aviation law OPS M6-1 as follows:

If manufacturer has not given instructions for maintenance for reserve canopy or harness, checking period cannot be greater than 24 months. If date of manufacture is older than 14 years old, checking period cannot be greater than 12 months.

Rigger must pack reserve parachute according to the instructions and period given by a manufacturer. If manufacturer has not set packing period for reserve parachute, packing period cannot be over 12 months.

Main canopy, reserve canopy, harness and AAD must have a gear card, where can be seen identifiers, checks, maintenance, fixes, and reserve packings. Documentation for older gear is a maintenance book instead of card that has the same info included. Book might have also additional info about the history of the gear.

Manufacturer can also give additional requirements and instructions for maintenance. These must be followed.

Reserve canopy and harness is always checked together. Main canopy is advised to be present, since it has parts of the harness, such as risers, deployment bag, bridle and pilot chute. They are checked together with the harness.

During reserve parachute packing also main canopy is briefly checked. This is the reason skydiving gear should be delivered for maintenance in a total package. It is also easier to deliver for maintenance completely packed.

Good gear back usually is worth the money. Gear back protects the gear while storing and transporting. Gear stays in good condition for longer and do not require as much maintenance.

21.2 Maintenance

Checks and maintenance can be performed by riggers. There are three different levels for riggers. A, B and C. Each level has different rights for maintaining and checking.

Roughly these levels can be divided as follows:

Rigger A can
- Pack a reserve parachute.
- Perform small maintenance tasks such as fix stiches or attaching toggles.

Rigger B can (on top of what rigger A can)
- Perform checks for main parachute.
- Attach main parachute to harness.
- Fix main parachute.
- Fix harnesses non-load bearing parts.

Rigger C can (on top of what A and B can)
- Check harness and reserve parachute.
- Attach reserve parachute to harness.
- Fix reserve parachute.
- Perform fixes for all parts of the main parachute and harness according to instructions given by the manufacturer.

21.3 Things related to getting a parachute

There are always risks involved when buying used gear. You must be careful and ask for help from more experienced skydivers. Club riggers are usually good help when getting used gear.

You should always check the documentation when buying used gear. You can ask for help checking the documentation from riggers and instructors. Documentation can be re-done afterwards, in these cases you never can be sure about the history of the gear. When documentation and history is not clear, it is healthy to be skeptical about the gear.

Check following points from the documentation and compare them to the actual gear:
- Parachute and harness make and model, serial numbers and other identifiers must match the gear. Canopy identifiers usually are in center of the tail on top skin. In harnesses identifier locations varies between manufacturers. You can ask for help from more experienced jumpers for checking identifiers.
- When owner is changed, it should be documented to documentation.
- Periodic checks, maintenance and fixes for canopies, harness and AAD can be found from the documentation. Next required maintenance dates should be taken in to account.
- AAD card includes on top of identifiers also possible required maintenances and battery changes.
- When buying only part of a parachute notice, that main- and reserve parachute includes connectors or soft links, lines, slider and the canopy itself. Harness includes pilot chute with bridle, toggles, raisers and deployment bags for main- and reserve parachutes.

When buying a parachute, it is important to remember your requirements that are related to the discipline you want to pursue and what is the true need for getting it. You should also think if you need a completely new one or can you live with used one at first.

21.4 Checks

Used canopy or a complete parachute system should be checked periodically by a rigger and always before making buying decision. By test jumping and checking for example canopy porosity and line shape and their effect on performance can be determined. Checks also tells you how much the gear needs maintenance or fixes and these helps determine the price. Fitting is also important to determine for potential buyer.

When checking condition rigger looks for faults and wear from harness and main- and reserve canopies. Lower steering lines and wear in leg straps are most common and visible signs of normal wear. Parachute system is affected things and things to look out for:

- Lines wear when they are used. Lineset usually lasts for 300–500 jumps. Lines made out of microline usually shrinks unevenly, this is caused by heat from slider sliding down during deployment, this usually causes performance issues in flight characteristics and deployment.
- Pilot chute and canopy usually gets burn marks while using them, careless packing might cause them more.
- If packing without any kind of packing mat it might add more wear on harness. Also jumping in places where there is a lot of sand.
- Consumable parts such as lines, steering lines, velcros, deployment system parts and stitching should be checked regularly. They should be replaced or fixed on time, so problems will not grow dangerously big.

Fixes done during routine maintenance might feel expensive, but they guarantee that the gear works and is safe to use. These issues can be fixed by riggers, within their rigger level limitations.

21.5 Daily care

Daily care includes:

- Packing according to the manufacturer's instructions.
- Removal of twists in steering lines, bridle and pilot chute kill-line.
- Checking wear and length of a closing loop and replacing it if necessary.
- Removal of sand and other trash by shaking from the tail.
- Replacing broken deployment bag rubber bands and harness strap holders.
- Checking consumable parts and cleaning out the harness from extra dirt, use soft brush or vacuum cleaner if necessary.

You should also follow these things regularly:

1. Harness
   - Overall wear.
   - Rips and tears.
   - Shoulder flaps and closing flaps.
2. Straps
   - Wear and overall condition.
   - Dirt.

3. Bottom of container
- Tightness.
- Spandex condition, flexibility.

4. Closing loop
- Is it in good condition?
- Is it right length?

5. All metal parts
- Oxidation, rust.
- Dents and tears.

6. Hard plastics (in flaps)
- In good condition and in shape.
- Fabric is not broken at the edges of flaps.

7. Grommets
- In shape and no visible wear.
- Edges tightly against the fabric, fingernail is not allowed to fit in between.

8. Velcros
- Strength.
- Wear.
- Opposite parts neatly together, should not be able to wear other parts.
- Notice also velcros also in jumpsuit or camera holder.

9. 3-ring release system
- Shape and condition of rings.
- Correct routing.
- Riser flexibility.
- Loop condition.
- Maintenance according to instructions given by the manufacturer.

10. Risers
- Wear in upper parts and connectors.
- Grommets.
- Toggle holders.
- Velcros.

11. Canopy
- Fabric condition.
- Stitching.

12. Deployment bag
- Condition.
- Grommets in shape and tightly in place.

13. Bridle
- Condition.
- Pin attachment.
- Shape of the kill-line.

14. Pilot chute
- Condition of the fabric.
- Handle attachment.

15. Lines
- Condition and wear.
- Trim.

16. Slider
- Condition.
- Kill-line conditions.

17. Automatic activation device
- Next maintenance.
- Possible error messages.

More info can be found from manufacturers documentation and instructions from their websites.

While storing and maintaining gear following things should be taken in to account:
- Avoid washing your harness or canopy. If absolutely necessary, washing can be done but you should consult rigger about it.
- Gear storing places should be dry and there should not be anything that might harm your gear or anything flammable.
- Gear is stored in dark, dry place. Parachute is stored best in a gear bag. Parachute should be stored packed. This way the most fragile part, canopy, is secured by the rest of the harness.

When gear is in good shape, it is safe to jump. Gear is maintained daily by yourself and rigger is consulted if there is anything out of the ordinary. If gear is not maintained and checked, you are not allowed to jump it. Regular checks and maintenance prevents bigger costs in future.

21.6 Exercise

1. Get to know maintenance books and gear documentation.
2. Perform condition checks on harness and perform daily maintenance.

22 Packing a student parachute

A student has a right to pack a main parachute under responsibility and supervision of a current A-, B-, C- or D-license holder or person certified by a Finnish Aeronautical Association.

Also student (or any other person) can receive a right to pack main parachutes to where he/she has received a training and passed both, practical and theory tests given either by a chief instructor or chief rigger. Passing gives a right also to supervise and give packing checks for students.

A-license holder and above has a right to pack main parachutes where he/she has received a training, he/she is also able to supervise and give packing checks for students.

This is the reason why packing and especially checking has to be practiced well, and this is the reason there is a practical test before receiving an A-license.

22.1 First check

Person doing the first check makes sure that:

- Harness and canopy is visibly in good shape, harness is intact and cleaned after a possible parachute landing fall.
- Harness is set on the ground back downwards, 3-ring release system is against the ground and risers are not twisted.
- Main parachute closing loop, bridle, deployment bag and pilot chute is visibly in good condition. Slider and pilot chute are cocked.
- SL-line, lock and pin/ripcord handle are in good condition and there is no visible wear on them.
- 3-ring release system is routed correctly and their loops are in good condition.
- Connectors or soft links are in good condition.
- Brakes are set correctly, toggle tips are put through the steering line and are on the lower side of the metal ring in the riser, toggles are secured in their place.
- Excess steering line is tucked nicely to a correct place.
- Canopy is cleared, this means that steering lines are separate from other lines and are straight from the toggles through the slider to the tail of the canopy.
- Canopy is flaked neatly on both sides.
- Tail is flaked to the sides.
- Lines are tight and in the middle: 4+4 steering-, 5+5 D-, 5+5 C-, 5+5 B- and 5+5 A-lines.
- Slider is down and set as a cross, grommets against slider stoppers.
- There are nine cells, they are counted and solved.

Checking needs to be done in detail so packing does not need to be cancelled by an error found in later phase. After this checker will sign recognizably the first checking to a packing card.

22.2 Second check

Person performing second check goes through following points:

- Canopy is set in deployment bag neatly.
- Slider has stayed up.
- Bridle has been pulled out from the deployment bag up until the attachment point and there is no canopy fabric between the grommet and the bridle.
- Bridle or SL-line is not twisted.
- All lines are in order and in rubber bands evenly and rubber bands are tight.
- Stows are in order.
- Stows are appropriate length, stows goes through the rubber band about 5cm.
- Person giving the second check is responsible (with packer) also closing the harness.
    - Deployment bag is set in to the container correctly.
    - Risers are routed straight and deep enough and they are not tucked under the side of the reserve parachute container.
    - Brakes and toggles are still set.
    - Bridle or SL-line is routed correctly between the flaps.
    - Possible spring loaded pilot chute or SL-system is packed correctly.
    - Container is closed according to instructions and pull-up cord is removed.
    - Pilot chute and bridle is packed correctly.
    - Finalize the packing, possible SL-line is routed neatly in place.

Only after the harness is completely done and closed, person giving the check signs the packing card.

22.3 Exercise

1. Practice checking student parachute packjobs during each packjob you make from this point on.
2. Notice differences in checking with different deployment systems: SL, spring loaded- or throw out pilot chutes and get familiar with your local club instructions and possibly manufacturer's instructions regarding packing.

23 Rules, laws and regulations

Laws, rules, regulations, training programs, announcements regarding skydiving activities are created to bring clear and unison way to perform skydiving activities and to prevent accidents. Aviation regulations approved by Traficom Finnish Aeronautical Association has created training programs and rules and regulations for skydivers. Also Parachuting Committee publishes instructions and announcements that has to be followed.

If an instruction and rule or regulation are inconsistent, rules and regulations are always more important and should be followed. However, instructions can fulfill or add to rule or regulation. Also clubs are allowed to specify and stricken rules for their own operation.

All documentation should be familiarized with and they are tested before receiving A-license. At least following documentation should be available for each skydiver. Remember to follow for possible updates.

23.1 Laws

- Ilmailulaki 864/2014.
  finlex.fi/fi/laki/ajantasa/2014/20140864

23.2 Aviation operational rules and regulations

- OPS M6-1, Laskuvarjohyppytoiminta.
  traficom.fi/fi/liikenne/ilmailu/ilmailumaarayskokoelma

23.3 Finnish Aeronautical Association instructions

- Skydiver operational instructions and eligibility requirements
- Maintenance instructions
  laskuvarjotoimikunta.ilmailuliitto.fi/materiaalipankki

23.4 Others

- Safety and equipment announcements
- Instructions regarding club and airport

24 Organizing skydiving activities

Organizing skydiving activities is responsibility of all A-, B-, C- and D-license skydivers. Instructors or even more experienced skydivers might not always be present at the club to take care of routines that are required before, during and after regular skydiving activities by rules and regulations. This chapter gives overall instructions for such activities. All of them might not be necessary at all clubs and some clubs requires some additional tasks that are not listed on this chapter. This is the reason you need to discuss with your instructors about your local club rules and also figure out local rules if you are visiting some other club. Also some of the responsibility roles are introduced. You also will get brief basic knowledge regarding weather requirements in skydiving activities, planes loading and maintaining balance and their effects on skydiving safety.

24.1 Load master

Each skydiving load has to have a load master who is responsible for the load. Load master must be at least A-license holder. Load master is responsible for the load throughout. For example if instructor who is dropping students and jumps also from a lower altitude, there must be another load master specified who is responsible for the rest of the flight.

Load master must have a possibility to communicate with the pilot in case of emergency or change of original flight plan. Pilot and the rest of the load must know who the load master is.

Load master duties includes following and overseeing skydiving rules and regulations during the load. Load master is responsible to create a safe and organized load. Duties usually includes at least:

- Determine exit order, jumprun direction and landing patterns for other skydivers.
- Inform plans for the pilot before and during the flight.
- Inform other skydivers where check-lists and instructions can be found in the plane.
- Be responsible for loading the plane and during the flight.
- Inform organization for any deviations found that can affect safety or flight eligibility, and any incidents where safety has been or could have been compromised.
- Communicate with the pilot in case of a deviation or emergency and inform the rest of the load.

Organization related duty lists should be given to all skydivers as a written instructions and announced to skydivers and pilots. Instructions can be included in a skydiving operations manual or similar. Load master can prevent a person from skydiving if that person is not following rules and regulations. Before your check dive you need to be able to do all tasks required from a load master, especially in a bigger clubs this is a big responsibility that needs sufficient amount of practice.

24.2 Chief pilot

It is suggested for a skydiving organization to have a chief pilot. Chief pilot responsibilities usually includes:

- Works together with the rest of the organization on skydiving operations safety related issues.
- Is responsible for operating, updating and development of skydiving operations related rules and regulations.
- Creates and updates standard operating methods for skydiving operations.
- Determines requirements for pilot training for skydiving operations.
- Organizes skydiving operation hazard recognition, risk analyzing, controls them and oversees that they are realized.
- Organizes a list for approved pilots and their eligibility.
- Offers guidance in skydiving operations related issues.

24.3 Starting skydiving activities

Air traffic controllers are informed about start of a skydiving activities. Informing is done in a certain form and clubs have instructions available. In some clubs this is done by pilots. If possible, METAR, TAF and LLF reports should be used when planning skydiving activities that are compared to minimum requirements for skydiving activities.

Current weather conditions must be solved, there must be a decision if the weather is suitable for such activities. Weather- and other important information is added to their respective places at the club. For example exit spot, reserved area and lading pattern can be added to aerial photo at the club.

It is important to determine the exit spot and inform pilot about the jumprun that is going to be flown. Also pilot needs to be a member of the club and holds appropriate training for operating skydiving activities for plane type that is used. Regular club pilots naturally possess all things required.

Landing area must be in required condition for skydiving activities. Also devices for showing wind speed and -direction must be checked. It is suggested to compare actual wind to reports.

If activities requires a ground observer to be present, his/her abilities and responsibilities must be clarified before starting activities. Also all possible equipment for ground observer should be checked (for example first aid kit, saving equipment, boat, radio, car). If some of the equipment are further away, they also need to be checked.

Gear checks and documentation should be checked for all visiting skydivers.

Checks for a plane is done by a pilot according to a manual who is responsible as a pilot for the plane and safety of all on board. There must be on each flight easily accessible check lists and a knife or similar cutting device for pilot and skydivers and everyone must be aware of the location.

Also there must be a seating space and seat belt for each person on board.

Skydiver can use floor as a seating place if he/she has possibility to hold on to something or latch him/herself to something.

When operating with some other flight device than usual plane, it must be checked that the manual of the device has approval for opening the door middle of the flight or fly with door open. In planes that clubs owns this thing is already checked.

24.4 Weather requirements

Skydiving flights are practically always performed as a VFR (visual flight rules). This means that the plane must be able to maintain certain minimum distance to clouds at all phases of the flight. When flying VFR the plane cannot be in a cloud at any point of the flight.

VFR flights requires following distances to clouds: horizontal distance 1,5km and vertical 300m (1000ft). Practically this means that the plane can climb over a cloud only if there is a hole in the cloud with diameter of 3km. Flying right on the bottom of a cloud is also not allowed.

While planning skydiving activities skydivers must observe weather with these things in mind and in no circumstances, pilot should be pressured to fly in bad conditions. Flying in a cloud during VFR flight is always dangerous situation since pilot without VFR training might lose their orientation and control of the plane. As dangerous is frosting (in body of the plane) that happens when plane flies through cold water in for example cloud or blow a raining cloud.

24.5 Brief info about loading and balance

Airplane is one of the safety-oriented devices if loaded and handled correctly. It for example tries to correct errors by itself and handling an airplane cannot require anything more than ordinary abilities from a pilot by rules and regulations. This however is true only, when given limits are followed.

Skydivers can effect on safety on-board with two factors: weight and balance, more accurately where the weight is inside the plane on horizontal axis.

While calculating maximum weight we start with the maximum takeoff mass, MTOM. That is given by the manufacturer. It is the weight of an empty body, added with fuel, pilot and skydivers. From maximum takeoff mass we reduce the weight of the body, pilot and fuel, and we get a maximum weight for skydivers.

Center of gravity (term center of mass is also used) is a location of a center point of the total weight carried in a plane in relation of specific line (for example front side of the wing or wall of a cockpit). Actual center of gravity is formed as an average center of gravity between planes own weight and payload. Center of gravity for a payload is formed by weight and location of each individual part (for example individual skydiver).

Center of gravity must stay within the limits given by the manufacturer, which is a certain distance from that specified line. This way the plane flies as designed. If center of gravity is outside these

limits, plane quickly becomes unstable and unpredictable to fly. It might for example after a normal maneuver to try and continue that maneuver instead of trying to stabilize. In worst case scenario pilot might lose the control of the plane. In skydiving activities, common danger is the load to be too far back, that causes the center of gravity to be too far back. This risk is higher especially with bigger formations and even more if the door is in the back of the plane.

Center of gravity should not be outside of given limits at any point of the flight. This is a reason we plan and follow the plan when loading and moving around in the plane, even while the plane is on the ground. Possible markings for acceptable areas for seating or moving around is part of student training.

We usually try to get the center of gravity as forward as possible during takeoff by leaning towards the nose of the plane. This does not have anything to do with planes ability to takeoff, just a precaution in case of an engine out situation. During loss of power from the engine it helps the pilot to control the plane if center of gravity is as forward as possible. After the takeoff it might help general climbing to altitude if center of gravity moves slightly backwards (however within the limits) and it is more comfortable for skydivers to sit on-board. Remember, that the pilot is the chief of the plane, and instructor or coach is students chief, who guides students.

Skydiving operation might be necessary to cancel in a way that either all, or some skydivers land with the plane. If no one jumps, everyone must remain at same location than during takeoff and if the plane has seatbelts, they should be attached as soon as possible. If there are only some of the jumpers left during landing, they should position themselves according to the instructions given by the club in order for the center of gravity to remain within limits. Places must be held also after the landing and during taxiing. You can leave from the plane only after the pilot has given you permission.

24.6 Plane stall

It should be noted that wing stalls always with a same angle of attack regardless the airspeed. A lot of people has a misconception that stalling is dependent on airspeed. If the mass is taken too far back by skydivers, pilot cannot compensate the tail pushing downwards regardless of the speed. Stalling always results to a loss of control.

24.7 During activities

Airports often have also other people than just skydivers present. So cooperation with others using the airport is important.

During activities it is important to remember to fill out load sheets and name ground personnel. Pilots brakes should be also taken care of by skydivers.

Weather conditions might change during the day, for example exit spot or highest possible altitude. If there is visible markings for this information, it should be updated throughout the day and remember to inform others at the airport also if there are changes of plans.

In the plane it is important to make sure you have permission to jump and jumping is notified for other users of the airport. You must take in to account also others at the airport.

Weather should be monitored constantly throughout the day and if necessary, activities must be put on hold.

24.8 Ending activities

After the day is done, remember to make all necessary reports and terminate the flight plan. Plane must be secured or transferred to hangar. All used gear is put back their places.

Starting, continuing and stopping activities have a lot of club specific rules and practices. Learning these are basis for development of a safe individual skydiver and they need a lot of repetition to be mastered. if something is still unclear to you, discuss with your instructors or club representatives.

24.9 Training organization

Organization who is giving you training is formed by: chief instructor, chief rigger, safety officer, instructors and coaches.

24.9.1 Chief instructor and assistant chief instructor

Person who is responsible for the training as a whole is called a chief instructor. That person is organizing all student activities. His/her responsibility is to make sure all aviation rules and regulations and current Finnish Aeronautical Association guidelines are followed. He/she is also responsible that up to date material and program is available for instructors and is being followed.

Possible assistant chief instructor supports and fills for chief instructor if necessary. When acting as a substitute for a chief instructor assistant has the same rights and responsibilities as the chief. Chief can limit rights and responsibilities for the assistant if he/she sees that it is necessary. Chief- and assistant chief instructor oversees and develops student training and intervenes if necessary. Chief instructor approves instructors, coaches, student gear and their storing facilities. Chief instructor keeps a list of previously listed things and updates that list throughout the year. List must include approval dates and signature.

24.9.2 Chief rigger

All student gear packing at the club must be done according to instructions given by the chief rigger. Ask instructors where your local packing instructions are located.

24.9.3 Safety officer

Safety officer oversees skydiving activities and safety. Officer makes sure licensed skydivers follows all rules and regulations set by the aviation law and Finnish Aeronautical Association. Safety officer makes sure that all dangerous situations or potentially dangerous situations are

reported to the Finnish Aeronautical Association (see chapter 1.4) as soon as possible. Safety officer makes sure all rules and regulations are available for all who participate in skydiving activities (Safety officer records or electronic version on club website).

Safety officer works together with the rest of the organization on safety related matters. It is suggested for the organization to form a safety group that involves safety officer, club president, chief instructor, chief pilot and jumpers with a variety of experience levels. It is also suggested for the organization to create a safety management system (SMS). Organization sets the rights and responsibilities for the safety officer as a written declaration that can be attached to skydiving activities handbook or similar. Safety officer can prevent person from skydiving activities if rules and regulations are not followed. Safety officer must have sufficient understanding and knowledge of skydiving activities and safety.

Rules and responsibilities for a safety officer is given by the organization with written instructions. These instructions can be attached to an overall instructions regarding flying operations or skydiving activities.

Safety officer can prevent jumping for a person who is not following rules and regulations. Safety officer must have necessary knowledge about skydiving operations and skydiving safety in general in relation to the size of the operation. Ask from your instructor where you can find your clubs rules and regulations and familiarize yourself with it.

24.9.4 Instructors and coaches

Instructors and coaches assures according to the instructions given by the chief instructor that the training given by them is safe and rules and regulations are followed by all parties involved. Instructors and coaches are responsible for making sure that everyone involved in the training process have appropriate certifications and ratings.

24.9.5 Assistant coaches

Assistant coach (ground training and radio) can be person who has B-license, 100 self-deployed skydives and approval from the chief instructor.

24.10 Exercise

1. Write down contact info for air traffic controller and other necessary connections.
2. Practice creating a jumping plan announcement and airspace reserving (if done by skydivers at your club).
3. Perform necessary actions for starting skydiving activities.
4. Perform necessary actions for terminating skydiving activities.
5. Get to know your local instructions.
6. Go through most important special tasks at your local club.

25 Special activities

After receiving your A-license it is possible to start to broaden your skydiving experience by starting to practice your desired discipline. Once you are more experienced it is possible to start jumping different special jumps, such as night-, water- or show jumps. This kind of specialties brings variation to normal operations but requires more careful and professional planning. Rules by Finnish Aeronautical Association might set some limitations for some of these activities regarding experience or equipment.

Your own basic skill must be at a level where challenges does not become risks.

25.1 Night jumps

On top of what normal skydiving operations requires, according to Finnish Aeronautical Association rules and regulations night jumps are allowed with following conditions:

- Skydiver is at least C-license holder.
- Skydiver has illuminated or self-illuminating altimeter.
- Skydiver is equipped with a light that is attached firmly and visible to surroundings.
- Skydiver has a directable light for checking the canopy.
- Landing area is illuminated.

Night is defined in European flight regulations (SERA article 2, section 97) as follows: “night” means the hours between the end of evening civil twilight and the beginning of morning civil twilight. Civil twilight ends in the evening when the center of the sun’s disc is 6 degrees below the horizon and begins in the morning when the center of the sun’s disc is 6 degrees below the horizon.

Flying at night is also more limited during night compared to daytime. Pilot must possess night flying certification and plane must have necessary tools for night flying.

Ground personnel must be aware of their tasks and they must be able to act in dark (necessary flashlights). There should be a radio to contact the plane. Landing area is illuminated by using for example cars that are parked safely nearby the landing area. Lights should be directed in a way that they do not blind landing skydivers.

Lights used must be reliable and they must be attached in a way that the freefall will not effect on them. It is important to place the lights in a way that they do not disturb other jumpers. All extra accessories used must be placed in a way that they do not have an effect on normal movement required for skydiving, for example deployment or emergency procedures.

Conditions must be good while jumping at night. While skydiving at night there should not be clouds below the exit altitude. Notice also upper winds and their direction, night jumps should not be done during stronger upper winds.

Special jumps are always added stress. During night it takes longer time to notice surroundings and reacting. Landing is harder despite lighting and exit spot might not always be correct, so keep that in mind while choosing your equipment.

Preparations for jumping always start with good planning. Skydivers must get to know the area during daytime. Deployment and emergency procedures must be practiced.

Conditions and forecast must be read well. Wind direction often changes after the sunset. Lights placement, attachment and functionality must be checked. Before you jump, go over your plan with more experienced skydiver. Deployment and landing order should be planned ahead and they should be followed.

First night jump should not be in a group and it should not be complicated plan. Before you jump make sure you have good night vision on your eyes. Night vision develops usually in an hour. Smoking reduces night vision.

While in a plane, do not blind others. Exit spot must be determined accurately. Jump itself is done according to the plan. If it is a group skydive, break-off altitude should be set higher than normally. On top of break-off tracking deployments should be done in sequence. Do not fly aggressively under the canopy.

25.2 Water jumps

Skydiver must have at least B-license to perform water jumps. Jumper must have appropriate floating device and there must be appropriate saving device for moving in the water and assistant for each skydiver.

Exit spot must be determined well. Avoid jumping far away from the shore and to a strong current. On top of normal ground personnel tasks there should be preparations for saving a skydiver from the water. Boat used must be stable enough. It should not tip over even when a person leans over the board to save skydiver from the water.

When choosing your equipment notice that not all AADs or altimeters can survive water. If exit altitude is not higher than 1500m, visual altimeter is not required. After deployment and solving the canopy open RSL lock if you have it on your gear. This makes it possible to cutaway the main canopy once you are in the water if necessary.

Deployment and emergency procedures should be practiced while wearing your floating device, since placement of your handles might shift. When choosing the floating device it should be noted that it adds to your exit weight. Before you jump, go through your plan with more experienced jumpers.

When jumping, it must be taken in to account that there are no more skydivers than there are boats for saving. Cutting away your main over water can be fatal since water is surprisingly hard element and altitude is hard to estimate.

After the jump canopies and other gear should be dried in a place where they are not in direct sunlight. Canopies that have been in a salt water should be rinsed in fresh water before drying. Also reserve parachute must be opened and dried before re-packing. All metal parts should be dried as well as possible by using for example towel. ZP fabric does not shrink well, but all

materials used when assembling the canopy might not stay in shape after drying and that will have an effect on the performance. Also all saving devices must be serviced and stored well after the jump.

25.3 Jumping outside a normal landing area

25.3.1 Overall

Licensed skydiver might get an opportunity to jump outside a normal landing area. Landing might be performed to a pre-defined place or sometimes even a landing area is not known when boarding the aircraft. Pre-defined place might be for example a park for show jump. When jumping out of a hot air balloon the landing area might not be known before boarding.

All jumps should have good ground personnel. Always keep a phone with you when jumping outside a normal landing area! If you land far away from others, you can inform others easily that you are okay and tell them your locations. However you should try to land close to others, if you land somewhere by yourself and hurt yourself, it might be difficult to get help.

For using a landing area you should always ask permission from the owner of that land, even though it is legal to jump without a permission. Landing must not cause any harm or disruption and legal landing areas do not include yards, plantations, or otherwise special limited areas. For a random landing you might not be able to ask permission but choose your landing area in a way that it will not cause any damages. Yards and plantations should always be avoided. For example landing close to animals should be avoided, since animals might defend themselves aggressively.

25.3.2 Jumping to a planned place and show jumps

Common planned landing spots are beaches, parks, and sporting fields. If you know your landing area in advance, get to know the area in advance. You must go to that location and check for example powerlines, light posts locations, and assess how well they are visible from the air. Jumping close to water it should always be noted that you might end up in water. Load master goes through the landing plan with the load always before boarding.

Show jumps are jumps jumped in public places. Usually in front of a crowd. Show jumps might be pre-ordered (for example family gatherings, festivals and so on) or organization is advertising their activities to public. Jump might be classified as show jump if there is crowd, even if it is not done to a pre-planned event. If it is, there should be plan made with event organizers about location of people and landing area. In event there should be restrictions to separate crowd from the landing area.

If done well, show jumps are really good advertising for the club and skydiving in general. Show jump is still really demanding jump. Planning and executing should be done well and risks should always be avoided. Even experienced skydivers make mistakes when pressure gets too high.

Show jumps requires at least C-license and you should always familiarize yourself with the location in advance. Discuss always with your local show jump experts and safety officer before taking part in a show jump.

Look more in Show Jump Instructions in Operational rules and regulations and eligibility requirements made by Finnish Aeronautical Association Parachuting Committee.

25.3.3 Jumping to an unknown location

Sometimes you must land in a place you don't know at all. This is typical especially when jumping from a hot air balloon. Hot air balloon drifts with the wind and that is the reason why there is no specific knowledge on the landing area. Also while jumping during a transportation flight you might be in a situation that you haven't had the opportunity to check the landing area in advance.

If you know the landing area but you cannot go there in advance, check at least weather conditions, and forecast in advance. Upper and lower level winds should be known while planning the landing pattern. Look maps and try to see if there is possible dangerous objects nearby. If possible, always get a ground person with a phone connection to the landing area.

Typical landing area when jumping from a hot air balloon is a field. If possible, you should choose the field already before jumping by spotting it from the balloon. Then you don't need to start choosing under the canopy and everyone can make the same decision and land close to each other. Then you have time to localize all power lines and other obstacles while under the canopy. Small power lines might go even through fields, so be careful! Bigger powerlines usually can be spotted with higher altitudes since they usually have trees cut away around them and there is visible straight line through a forest. It is better to land on a hayfield than field that is not growing yet, since plowed fields are bumpy place to land.

When jumping from a hot air balloon it is important to remember that it doesn't fly jumprun like an airplane. Usually jumpers deploy their parachutes straight under the balloon. Balloon jumps usually are done in a lower altitude so there is less time for tracking. First thing to do under the canopy is to find the balloon and fly away from underneath. Next group cannot jump before previous group has deployed and everyone has flown away from the balloon.

25.4 Boogies

Skydiving events are called boogies. Some of the boogies are more focused on jumping and learning and some partying. Boogies usually gather people around the world and aircrafts are usually bigger or there are more of them than usually at that location.

In Finland and other countries have annually many small and big boogies. When you have found a boogie that you are interested in the first thing to figure out is possible experience requirements and follow them. During boogies there often are bigger planes and groups are bigger, insufficient experience might cause dangerous situations.

Usually you save on registering fees if you register in advance. Materials offered by organizers should be read before the event. Some organizers might require third party liability insurance up to some pre-defined amount. You should always figure out your own insurance coverage abroad regarding skydiving activities. Insurances offered by Aeronautical Association have fairly small compensations in case of injury, and for example in United States they are often insufficient for

any kind of injuries. Association insurance covers skydiving activities in all countries that are following international rules and regulations for aviation during trips that are shorter than 3 months.

Arrive to boogies with enough time to get familiar with the location and local conditions. Before boogie starts there is usually info session for visiting skydivers that should be attended. If something is unclear, you should clarify it before boarding a plane. It is not only your safety that might be compromised, also safety of others.

Boogies often have big planes and/or there are a lot of them. This means there is a lot of canopies open at the same time in the same airspace. Landing pattern is strictly controlled and forced. There might be sanctions for landing somewhere else than assigned landing area.

Boogies are great place to get coaching from more experienced skydivers. International and local events often have organizers who organize groups for skydivers. There are often multiple groups for each discipline and skill level is taken in to account when creating these groups. You should be honest about your experience and skill level, it helps you to get most out of the jump without putting yourself or others in danger.

Parties are big part of boogies. You should have fun, but it is also important to be honest for yourself next morning.

In boogies all documentation and gear is carefully checked when registering to the event. Before you leave to boogie, you should make sure you have all documentation with you, check that your license, packing- and checking periods are up to date. Notice that reserve packing periods varies between countries. Especially deployment system is carefully checked in boogie gear checks.

Closing loops and length and bottom of container condition are checked. During a boogie it might be impossible to fix your gear if required or it might be really expensive.

25.5 Competitions

In skydiving there are a lot of different levels of competitions all the way from local club competitions to national and international competitions. For example World Cup and World Games are respected competitions.

National championships are held all around Finland and couple of times even outside of Finland. Sometimes competitions are combined where all disciplines are jumped at the same event. During latest years however different disciplines or discipline groups are separated. Clubs apply the right to host national championships from Finnish Aeronautical Association.

Official national championships at the moment are in conventional disciplines, accuracy landing, 4-way formation skydiving, vertical formation skydiving. canopy formation 2-way sequence. Artistic disciplines includes freestyle and freeflying (three person teams) are national championship disciplines.

At the moment there is only one possible place to host official canopy piloting competitions in Finland (distance, accuracy and speed), since there is only one official size swoop pond in Finland.

Wingsuit is the newest discipline in national championships, there is two different categories in wingsuiting: 3 person teams acrobatic and individual performance.

There have been for couple of years also national championships for wind tunnel flying. There is individual freestyle, 2-way dynamic and 4-way FS and VFS. These disciplines are essentially the same than in skydiving. These disciplines practices mainly in the tunnel and same teams are competing in the sky and in the tunnel.

There is also dynamic 2- and 4-way in the tunnel. Dynamic is a discipline that cannot be done in the sky, so it is pure tunnel sport.

At national level there has also been Para-Ski events, where there are two different categories. Where one is accuracy jump to a slope and then slalom or cross-country skiing (Nordic para-ski). There has not been competitions in past couple of years.

Unofficial disciplines are for example FS 16-way and speedstar. Artistic events can include skysurfing. CP can also include freestyle. Speed skydiving is new discipline, where the goal is simple, to gather as much speed as possible during freefall.

National championships requires competition license from Finnish Aeronautical Association (so called FIS-license) and sufficient skills to perform safely.

Competition organizers announces competition invitation where there is all necessary info, such as dates and place, plane used, last date to enter, price, accommodation, and food info.

At the location register to organizers that checks documentation and gear condition.

During national competitions FAI rules are followed with small local adjustments. International rules are annually confirmed by ISC meeting.

25.6 Disciplines

25.6.1 Canopy piloting

Canopy piloting, also known as swooping, is one of the most dangerous disciplines in skydiving. In swooping skydiver tries to achieve maximum distance and accuracy for their glide after the flare and it happens right over the ground.

Swoop usually begins with gathering of speed, where skydiver turns their canopy to dive, dive is corrected right before the ground so optimal speed is achieved for the swoop. Canopy pilots usually achieves over 100km/h speed.

Swooping is really difficult discipline in skydiving. Swooping happens close to the ground, so it is really good spectator sport.

25.6.2 Freeflying

In freeflying the goal is to fly with high diversity of orientations. Basic positions for freeflying are head down, head up and tracking. In formation skydiving formations are usually done at a same level, but in freeflying also third dimension is used. As the name states, flying is free and only your imagination is the limit.

In competitions freeflying is done in three person teams, where one person takes a video while two others perform artistic formations and movement. During the jump skydivers take different kind of grips and flies different formations with each other.

25.6.3 Freestyle

Freestyle is skydiving where different orientations, movements, turns, and spins forms a routines. Many movements are taken straight from pool diving, dancing or gymnastics and there are elements added which are made possible by flying.

In competitions freestyle is done in two person teams, where one is camera flyer and other is performer. Judgment is done based on artistic, difficulty and quality standards. Also camera work is judged.

25.6.4 Canopy formation (CF)

Canopy formation skydiving (formerly known as CRW, canopy relative work) skydivers are doing formations with deployed canopies by taking grips from other people lines. There is specially designed parachutes for jumping CF, that are reliable in different situations. They have their own type of deployment system and they are stronger than normal canopies.

In CP there is two different categories: sequence and rotation. In sequence 2 or 4 person teams are docking as a tower and also sideways and try to make as many pre-defined formations as possible. In rotation all four jumpers dock as a stack on top of each other, and the top most skydiver rotates to the bottom of the stack. Jumps are judged by the video taken by a camera flyer.

25.6.5 Formation skydiving

In formation skydiving teams are doing formations while in freefall by taking grips from each other. Formation skydiving is really good way to practice if you want to develop your freefalling skills and learn to control your body in freefall. Formation skydiving offers challenge also for more experienced skydivers.

In competition formation skydiving is done in 4- and 8 person teams. In a team there is also a camera flyer whose job is to take a video for judges. During events and boogies there might also be bigway jumps where there might be tens or even hundreds of people.

VFS (Vertical Formation Skydiving) is sort of combination of FS and freeflying. Teams are similar than in FS. Team does pre-defined formations during freefall. During competitions points are calculated same way in FS and VFS.

VFS is similar to freeflying in a way that it is done in other orientations than belly to earth orientation. Depending on the formation you fly either in head down or head down orientation.

25.6.6 Wingsuit

By using a wingsuit skydivers can achieve higher freefall time and also fly even long distances by using the wingsuit. High skilled wingsuit flyer can fly 7-8km in normal 3km freefall and achieve over 200km/h horizontal speed.

In competitions, there are two different categories for wingsuiting. Acrobatic includes three person teams where criteria includes team skill, showiness, and camera work. One member is taking video from other two. Performance is individual event, where points are gathered from three different types of jumps, longest freefall time, longest distance travelled and highest speed between 3 and 2 kilometers altitude. Scores are gathered from a GPS device.

Flying a wingsuit effects a lot on your freefall speed and requires good body control during the freefall. Starting a wingsuit flying in Finland requires at least an A-license, suitable wingsuit for your experience level and training and minimum skills required by manufacturers.

25.6.7 Speed skydiving

Speed skydiving is newest competition sport. There the goal is simple: gather as much speed as possible during freefall as possible. Data is gathered between 3 and 2 km altitude.

At the moment top scores are over 600km/h.

New microprocessor based devices has made speed skydiving possible as competition sport. They make accurate readings possible for competitions.

25.6.8 Style

Style skydiving skydivers tries to make a combination of movements as fast as possible that includes two 360 degree turns and two backflips. Jump is videoed from the ground and to the time is added possible mistakes in turns and flips. Style is jumped from 2200m. At the beginning of the jump skydivers tries to gather as much speed as possible for the combination. Some style skydivers uses similar kind of rubber suits than skiers.

25.6.9 Accuracy

Accuracy skydiving as a competition sport is with style one of the oldest disciplines in skydiving. In accuracy skydiving jumper tries to land as accurately as possible to a spot that is only 2cm diameter. After deployment skydiver must assess winds accurately, so they can land to specific spot. Last couple of meters skydiver approaches the target straight from the top and tries to place

their feet accurately in the middle of the target. Scores are measured up to 15cm, all scores over that are marked as 16cm. In national and international competitions canopies used are specially designed for accuracy by their size and profile. Accuracy can be done also with other canopies and even get good scores. It is also good practice to learn your own canopy.

Style and accuracy is referred as conventional disciplines. Often they go hand in hand together, and skydivers who are attending one, often practice both. During competitions there usually is also combined prizes.

25.6.10 Camera flying

Even though in competitions camera flyers are part of formation, freestyle, freeflying, canopy formation or wingsuiting team, is skydiving photography its' own artform.

Skydiving camera work has developed in these past years from really specialty profession to common hobby that skydivers even with small amount of experience can perform. This development is possible by smaller and cheaper cameras. Nowadays often skydivers uses small digital action cameras that have good video quality.

Camera work offers different challenges depending on your desires. In CP camera is worked while canopy is open and freestyle camera work requires at times even aggressive flying during freefall.

There is even jumpsuits designed for camera work. For example while videoing formation skydiving camera flyers often wear jumpsuits that have small wings between their arms and body for better control of the freefall speed.

Camera jumping is one way to develop your skydiving skills. However it requires knowledge and a lot of focus. This is why the experience requirement is C-license. If your own flying skills are not under control it might cause a dangerous situation. Before you start working with cameras you should always consult more experience camera flyers about things that needs to be taken in to account. Audible altimeter is really useful while flying with camera.

26 Physiology

Skydiver must not have any birth- or acquired defect, injury or disability that might limit permanently performance or might suddenly cause a loss of ability to function in a way that might effect on safety.

Skydiver must not have difficult psychical disability or addiction. Epilepsy or similar neurological condition might prevent skydiving, and also heart condition or lung- or respiratory disease might cause a barrier for skydiving. Abnormalities in musculoskeletal system such as limitations in joint movement, easily dislocating shoulders or freshly broken bones or brain or skull damage also prevents skydiving. While pregnant you should not skydive.

Doctor can give permission for skydiving if disease, condition, or injury does not effect on safe skydiving or it is temporary. After pregnancy or disease you should always exercise good judgement before continuing skydiving activities.

26.1 Physical factors

Ears and nasal cavities are in general aviation organs that causes most trouble. While gasses expand during pressure changes causes problems if not handled correctly. Pressure changes might cause pain, ear ringing, locking or even ruptured eardrum. Pressure equalization of ears should be learned in already in the early phases of your career.

Yawning and swallowing are most commonly used method, if they do not help, blow out your nose carefully while holding your nose shut. If you have any flu symptoms you should avoid skydiving. Smoking combined with infection or allergy creates additional risk for diseases.

When flying altitude gets higher and air pressure lowers, oxygen level in air gets also lower. Oxygen saturation in your body lowers in result. Once required oxygen level required by the cells in your body gets too low, it will cause lack of oxygen, also known as hypoxia.

Objective symptoms of hypoxia includes for example personality changes, judgement gets lower, and it takes longer to make decisions. Also reactions gets slower and coordination gets worse. Hypoxia might affect your whole body, your vision, nerve system and also mental and motoric functions.

Risk for hypoxia is caused by physical activity and cold weather. In severe hypoxia your vision and focus is lower and your vision gets narrower and darker. Also you might feel dizziness, headache, floating sensation, anxiety, tiredness, sleepiness, numbness, and muscle spasms and at worst, loss of consciousness.

Following points effects on severity of hypoxia:

1. Time that it has taken to develop hypoxia.
2. Relative lack of oxygen compared to the need (physical activity).
3. Time that lack of oxygen occurs.
4. Personal abilities such as diseases and body form.

Most dangerous point in hypoxia is that it develops slowly over long period of time, so it is hard to notice.

Oxygen should always be taken in to account while planning when barometric altitude goes over 13000ft (NCO.SPEC.PAR.115). During skydiving operations skydivers do not need additional oxygen when barometric altitude is:

- Over 13000ft (3962m) less than 6 minutes.
- Over 15000ft (4572m) less than 3 minutes.

If additional oxygen is used, it is strongly suggested to use AAD. If exit altitude is more than 6000m (19658ft) it is suggested to have additional oxygen also during freefall. Hypoxia can be prevented by sitting calmly until exit and wearing warm clothes.

Hyperventilation is a situation where person breaths more than body needs. Breathing is shallow and quick and as a result, there is more carbon dioxide leaving the lungs than metabolism can produce.

Lowered carbon dioxide level in arterial blood causes contraction of blood vessels and also other various symptoms. These might be feeling of choking, chest pain, palpating sensation, hand tingle or numbness, dizziness or loss of consciousness. Elevated breathing frequency is normal reaction for stress. There might be multiple actual causes for hyperventilation, such as mental stress, feelings, carbon dioxide and caffeine. Previously thought way to breath in to a paper bag is not suggested any more, since it might be dangerous if the actual reason is some heart- or lung condition. Instead you should try to control your breathing for example by narrowing your lips to offer some resistance for breathing.

Dealing with hyperventilation is calming your breathing. Hyperventilating person is brought down with the plane and he is calmed down by talking and guiding for slower breathing.

After diving you should follow given preventative times before skydiving. After blood donation you should avoid skydiving for a week.

26.2 Drugs, alcohol and tobacco

Regular usage of drugs, even if it’s not a “triangle drug” might be a risk in skydiving. Person taking the drugs must ask him/herself if the condition or disease that the drugs are taken for is by itself a reason not to skydive. Some drugs are not suitable for skydiving, even though there is no warning triangle on the side of the box. You should always consult your doctor if some drug is suitable for skydiving.

Licensed skydiver is always responsible by him/herself together with a doctor about their usage of drugs. You must remember that the effects of the drugs might cause an accident and in that way they effect also on safety of others.

Sleeping pills and anxiety medication numbs senses and makes reactions slower. Effects of these might continue for multiple days after taking them. Strong painkillers are mainly prohibited since

they lower your performance and causes sleepiness. Drugs might cause long term effects that might be impossible to predict. Local anesthetics used by dentists requires a day before jumping.

You should never use drugs to win fear!

Side effects of smoking might be critical. Worst side effect in short term is that there is carbon monoxide in the smoke that lowers the blood oxygen level. For example smoking 3 cigarettes right before jumping causes blood CO level to be higher in a way, that for a smoker 1500m altitude is the same than non-smoker person 3750m altitude.

For skydivers performance even small amount of alcohol in blood is known to have clear effects. When there is even slight hypoxia the effects of alcohol is much higher. For example 1 serving in 3000m altitude corresponds to 3-4 servings at sea-level. This is the reason the limit for alcohol (also ground activities) is 0.

In Finland SUEK ry is taking care of anti-doping activities. Skydiving competitions follows official anti-doping rules. Athlete should always check before starting a medication from SUEK ry website if that medicine or method is allowed in competition sports. It is important to remember that even if some drug is allowed in competing, it might not be allowed in aviation.

26.3 Conditions and strength

Staying up late causes problems even in normal conditions, but even more when skydiving. Physical performance is lower even if for small portion of the jump (freefall) jumper might feel him/herself strong. Focus, sense of time, memory, learning and perception abilities and observing abilities are lower. Reaction time is longer, mistakes comes more common. But luckily most tasks learned to automation level can be performed even when tired. Risk for injury and bad judgement and bad performance is more common. Regular rest and sleep helps to get a good skydiving day.

Performance in human body lowers when temperature drops. When palm temperature (not air) gets below +30 degrees Celsius there is noticeable loss of strength and senses. Below +7 degrees Celsius you don’t feel pain or temperature anymore and your hands don’t function normally. Gloves are always a good idea to have during skydiving.

Acceleration and deceleration effects on skydiver on each jump during exit and deployment. During longer deceleration (more than 2 seconds) body tries to adjust to the situation, but when there is for example quicker than normal deployment there might be temporary loss of vision. During freefall negative acceleration in flat spin might cause loss of consciousness. Emergency procedures with high performance canopies during spinning malfunctions has to be done before spinning is so aggressive that it causes inability to perform. During collision deceleration is short term, so worst damages are structural damages to your body. Ability to stand G-forces is affected by for example body composition, overall physical endurance, diseases, dehydration, tiredness. Active, healthy, normal weight and normal stamina skydiver can stand normal G-forces multiple times during the day.

27 Risk factors, actions during accidents and first aid

27.1 Risks involved in skydiving

In case of a serious accident in skydiving usually it is the police department doing the investigations. In some special cases OTKES (Finnish accident investigation center) is involved. Investigation should figure out all factors causing the accident and it is used in future to prevent accidents. OTKES releases reports on their investigations and they are useful material for all skydivers. Also Parachuting Committee releases reports about skydiving safety.

In Finland there has been since 1962 27 fatalities (2020). Total number of jumps between 1962 and 2020 is around 1930000 jumps. Annual jump number in Finland is around 40 000.

Usually there is no one specific reason for an accident. Accidents usually are result of a multiple smaller factors. Risks and factors causing accidents usually are for example:

- Bad main parachute packing.
- Clothes are not suitable for conditions.
- Rental gear and often changing equipment.
- Changes in routines for EPs or steering.
- Too complicated plan in relation to skill level.
- Trying too hard with lower experience.
- Showing off.
- Wrong exit spot.
- Low break-off altitude, short tracking or bad tracking technique.
- Lack of airspace or altitude awareness.
- Aggressive steering in lower altitude.
- Tiredness, hangover, drugs, medication and jumping combined.
- Problems at home or work or at the club.

When minimizing risks you should take following points in to account:

- Know your own skills, knowledge and abilities, don’t overestimate them.
- Re-cap learned routines multiple times throughout the season.
- Jump often and participate in trainings.
- Follow rules and regulations and know club- and airport specific rules.
- Know turbulence and thermal hotspots at your club and fly away from them with full flight status.
- Get to know your gear in all conditions and avoid rentals.
- Use gear suitable for your experience level.
- Only use gear with AAD.
- Follow development in weather throughout the day.
- Don’t be selfish, notice others.
- Reserve enough altitude for the jump.
- Don’t hesitate to use your reserve.
- Use appropriate clothing depending on the temperature in all altitudes.
- Don’t pack dirty or wet parachute.
- Don’t jump to cloud.

- Remember, accident is not a private matter!

Skydiving safety is built on procedures. A good example of a procedure is your emergency procedures. Procedures helps us to practice actions often and well, always the same way so that while in crisis, our actions are automatic. Often after accidents we can observe that skydiver in question has not practiced procedures well enough or has a longer break in skydiving, when procedures tend to be forgotten. It is also important to remember, that we are in risk area especially when we change our procedures or gear. In many accidents one of partial causes for the accident has been that the skydiver has neglected safety instructions given in this guide.

27.2 Actions during accident

When accident occurs, ground person is usually the one who starts actions since he/she is usually the first one to notice that the accident occurred. This person usually has strong experience in club activities and skydiving in general. Skydivers who are present all together start actions described in this chapter. Officials who come to the scene usually include fire department and ambulances and officials takes the control once they arrive to the scene.

Actions during accident is also described in instructions written by Finnish Aeronautical Association (so far only in Finnish). Clubs own instructions for accidents should be located near a phone and carried with first aid equipment. Clubs own instructions takes in to account airport and club specific issues.

Actions at the scene of the accident are briefly:

Starting saving:

- Stop skydiving operations.
- 112 call.
- Notify air traffic control if airport has one.
- Start search party and help to the scene.
- Organize guidance for officials.

At the scene:

- Prevent future accidents (block a road or area).
- Perform first aid.
- Isolate the area and prevent unnecessary damage to the area.
- Try to keep injured skydivers gear as original state as possible, if possible.
- In case of a fatality, you should not move the body or any part of the gear, cover up the body if necessary.
- Take video or photos throughout the process from the area and injured skydiver itself.
- Make sure there is guidance for officials to the scene.

Perform following announcements and tasks afterwards:

- Notify club president, safety officer and chief instructor.
- Notify Finnish Aeronautical Association.
- Notify your own family and tell them you are okay.

- Gather videos, photos and statements from everyone at the scene and give them only to police and investigating officials.
- Take care of injured persons belongings.

Take care of crisis communication and announcements:

- Usually only officials make announcements.
- For the club, announcements is done by club officials (president and safety officer usually).
- If you are contacted by press, let them know that officials or club representatives take care of communication.
- Never inform injured person's name to anyone. When we are sure their family and close ones are aware, we can release the name within the skydiving community.
- Do not speculate on causes of the accident to outsiders.
- Do not speculate even within the club.
- Do not discuss about the accident in public places, such as restaurants, busses, sauna or anywhere where there are outsiders present.

Even during normal accidents 112 will send on top of ambulance and fire department a police patrol to the scene. Police investigates only criminal misconduct related issues and usually does not cause any future actions if there are no criminal neglecting or actions done. During more serious accidents (usually fatalities or if a plane is involved) Finnish Accident Investigation department (OTKES) does investigation to determine causes for the accident and background information. This investigation usually causes some safety related suggestions that should be taken seriously. Most of the rules and regulations regarding skydiving is unfortunately born during history and previous accidents. And OTKES reports are useful reading for safety oriented skydiver.

Really mild injuries these instructions can be followed briefly. For example sprain ankle does not require ambulance and skydiving operations are put on hold only as long as necessary actions prevents skydiving. After ambulance has left the scene or person who has used reserve parachute has located their belongings, operations can continue normally. In these cases might still be a good idea to notify club officials, since sometimes even normal situations goes public and press contacts club representatives.

27.3 First aid

Emergency first aid is usually for saving someone's life. The goal is to restore and maintain vital body functions as long as it takes for patient to get to actual care. Emergency first aid is started at the scene of the accident and is performed by first arrivals at the scene by someone who has some knowledge about first aid. Do not move the patient if it is not absolutely necessary. Nowadays the primary goal is to take the aid to the patient and not the other way around.

27.3.1 Emergency first aid

1. Figure out the general situation at the scene. Figure out if you can wake up the patient by talking or slightly shaking the body. If not…
2. Call for additional help, call 112. Put the phone on speaker and continue helping. Listen and respond questions asked to you and act as instructed. Tell who you are, where you are calling from and give direct address or driving instructions. Prepare to tell at least name of the

patient, patients condition (level of consciousness, breathing, blood flow, visible injuries). Hang up the phone only when instructed to do so.

3. Check if patient is breathing. Release the helmet buckle and other things potentially preventing breathing. If there is possibility for a neck injury which is usually really common in skydiving accidents, be really careful while moving patients head. Lift the head slightly by lifting with one hand from the chin and press on the forehead with another hand. Look, listen and feel for breathing. Does the chest move? Can you hear breathing? can you feel air on your face close to the patients mouth? Assess if breathing is normal or not or at all there. Use 10 seconds max for assessing the breathing, if you hesitate, act like breathing is not normal and patient should be turned over to the side.
4. If patient does not wake up or breathe normally, you should start CPR. Set patient on his/her back and start CPR. Set your palm in the middle of the chest and other hand on top of that hand, fingers overlapping.
5. Press 30 times with straight arms straight down in a way that chest is pressed 5-6cm. Let the chest recover between pressings. Average pace should be around 100 pressings per minute and do not exceed 120 presses per minute. Count out loud.
6. Blow twice. Open breathing canal by lifting chin, make sure mouth is empty. Press your mouth tightly around the mouth and close the nose with your fingers. Blow calmly air to patients lungs, look towards the chest while blowing if the chest moves. Repeat the blow. Two blows are about 5 seconds.
7. Continue CPR with relation 30:2 until patient wakes up, opens their eyes and breaths normally or professionals give you permission to stop or you physically can't continue longer.

27.3.2 Massive bleeding

This is how you stop bleeding:

1. Stop the bleeding by pressing it with your fingers or palm straight to the source of bleeding.
2. Set patient with massive bleeding down on the ground as soon as possible.
3. When there are bandages available, use them.
4. Lift bleeding limb upwards.

If bleeding does not stop and continues as massive, call 112. Listen and answer questions asked to you and act as instructed. Press big veins in close to the joints with force by using your hands to prevent blood flow. If bleeding still continues, set pressing bond close to the source (in emergency you can use for example canopy lines). Massive bleeding causes shock.

27.3.3 Shock

Shock can be caused by either internal or external bleeding. Person, who is in shock, is pale and cold sweating, patient is restless, mouth is dry and patient might complain that they are thirsty. Breathing is elevated and shallow, heart rate is fast and hard to find. Always remember possibility for a shock state and give necessary first aid for symptoms:

1. Set patient laying down.
2. Call 112 and listen and answer questions and act according to instructions given.
3. Cover patient from cold and try to calm him/her down.
4. Observe and secure breathing.

5. Lift legs if necessary.
6. Stop the bleeding, minimize pain and support fractures.
7. Do not offer food or drink.
8. Observe state of consciousness and changes on it.

27.3.4 Other first aid

Sprain / dislocating / fracture.

1. Set localize cold treatment by cooler bags, -sprays or similar (cold also helps to prevent internal bleeding).
2. if necessary, put an elastic bandage to support sprained joint.
3. Avoid moving injured limb. On top of pain it might cause more internal damages. Do not fix dislocated limb at any case, if it is necessary to move injured person before help is at the scene, you can support the limb with something found at the scene. Do not pull on dislocated joints.
4. If necessary, transport injured person to ER or call 112. Also since insurance technic issues it is usually necessary to go to doctor with all injuries as soon as possible after the injury.

27.4 Incident notification in skydiving

If there is any dangerous situations in skydiving operations where safety of skydivers or aircraft is compromised or could have been compromised, there must be a report (*turvallisuusilmoitus*) about it as soon as possible to Finnish Aeronautical Association.
https://portal.laskuvarjotoimikunta.fi/turvallisuus is the form. Incidents that always requires reporting are for example:

- All incidents that are dangerous or could have been dangerous.
- All parachute malfunctions.
- All jumps resulting in usage of a reserve parachute.
- All cases with injuries.

Report should be done as soon as possible after the incident. This report however does not release responsibility for making reports regarding aviation safety if necessary (GEN T1-4).

Report is done electronically.

You log in to the reporting system with your email, Facebook or Google accounts. First you choose what kind of incident is in question. There are the most common types of reports for templates, such as off landings or reserve rides. Also, there is templates for injuries or equipment failure. Also, one template is made for abnormalities in skydiving aviation.

After selecting the template, choose all that applies to your report. For example, bad deployment body position or using a reserve canopy and also if landing caused a sprained ankle. Next the form chooses only those fields that applies to your report. There is also testing version for the form, where you can practice and try the form without actually sending it. System also includes automatic statistics that can be found in Parachuting Committee website.

During student activities the report is filled always by instructor or coach together with the student. On other jumps reporting is done mainly by person(s) involved. It can be done also by a safety officer. If necessary, also others can make reports for other people. Report always results to an email to club representatives, usually club president, safety officer and chief instructor. Aeronautical Association representative is also notified with Parachuting Committee head of department and safety and equipment officials. They can also read the reports.

Purpose for reporting is to inform Finnish Aeronautical Association and skydivers about dangerous situations. Information helps in the future to develop practices, training and equipment.

Most important goal of preventative risk management is to recognize and eliminate possible threats before they occur. Dangerous situations can be controlled only if they are known. Safety reporting system can gather information regarding situations and conditions where danger is present for skydiving and aviation. This is the reason why even minor incidents should be reported since they can save lives.

27.1 Accident is usually caused by multiple factors and just a tip of an iceberg. Source: Traficom (2012)

Actions during accidents are told in aviation instructions GEN T1-4 and instructions given by Finnish Aeronautical Association. These can be found in Parachuting Committee website.

27.5 Exercise

1. Get to know the reporting tool on Parachuting Committee website.
2. Figure out where at your club safety officer has local materials and read it.
3. Get to know instructions given by Finnish Aeronautical Association.
4. Get to know local instructions on actions during accident.
5. Get to know public records regarding skydiving safety.
6. Get to know your clubs first aid equipment and instructions.

28 Advanced training jumps

28.1 Canopy practice -jumps

If student wishes to start using gear that is not meant to be used in a student program, these jumps must occur in order and before non-student gear is taken in to use. These jumps should be performed at the beginning of advanced training, if possible, student then has opportunity to practice these skills on all jumps after these.

- Exit altitude is at least 2000m, 8–10seconds of freefall.
- If there are club specific rules about deployment altitudes they should be taken in to account.
- If jumped from a greater altitude, deployment at least at 2000m.
- No free-fall practices during these jumps.

28.1.1 Actions by student

- Go through the plan.
- Check weather conditions.
- Determine the exit spot, remember that the time under canopy is greater due to a higher deployment altitude.

28.1.2 Learning objectives

- Learn to work with risers.
- Learn to work with different brake -positions.
- Learn different types of flaring.

28.1.3 During flight

Focus on your performance, make sure the exit spot is correct, since you’re deploying at higher altitude. Make sure others on the same load knows you’re deploying higher. Remember club specific rules.

28.1.4 Dive flow

After deployment, make sure you’re at the right location so you won’t arrive too early on top of the planned landing spot. Start doing planned exercises while maintaining good altitude awareness, awareness for your surroundings and location.

28.2 FS Jumps

On FS jumps the goal is to practice how to jump safely in a group. Dive flows are determined by the FS -dive flow for students attached to this section. Main point on these jumps is to jump in a group, so if coach and student holds required skills for freeflying, it can replace traditional FS

jumps on a student program. Goal and passing criteria is for a student to demonstrate all aspects for safe jumping in a group:

- Actions on the ground, in the plane and exit.
- Actions in freefall, approaching the formation and docking safely.
- Break-off and tracking (safe direction and enough separation to the group).
    - Break-off at 1800m at least on the first jump, after that it can be 1600m.
- Deployment altitude 1300m.
    - If skill level allows, break-off can be set for 1600m, start deployment at 1200m.
- Common denominator is the actions on approaching the formation on all group jumps:

LEVEL

- Match your fall rate and level in relation to the formation.

SLOT

- Fly your own free slot in the formation.

DOCK

- Dock yourself to the formation.

28.2.1 Actions by student

- Exit practices, setting up at the door, docking.
- Practicing on the ground (dirt diving).

28.2.2 Learning objectives

1. Safely acting in freefall when executing a planned jump.
2. Wave for break-off at planned altitude.
3. Track sufficiently to right direction (at least for 5 seconds).
4. Deploy at planned altitude.

28.2.3 During flight

If planned exit is linked, it needs to be executed simultaneously and each jumper needs to present themselves to the airflow correctly straight from the exit, practice mentally moving to the door and setting up for a well-executed exit.

28.2.4 Dive flow

Focus on your own performance and keep a good altitude awareness throughout the jump. Remember that safe jump is more important than successful jump plan.

28.3 Free-jumps

During free-jumps you can jump free-fly jumps from students FF guide.

- You are getting familiar with freeflying.
- You are getting used to other body orientations than basic belly -orientation.

28.3.1 Actions by student

- **Make sure the gear is suitable for freeflying.**
- Practice the body position on the ground.

28.3.2 Learning objectives

1. Plan the jump, jump the plan.
2. Signal for break-off at agreed upon altitude.
3. Track sufficiently to right direction (4–5 seconds).
4. Deploy at planned altitude.

28.3.3 During flight

If planned exit is linked, it needs to be executed simultaneously and each jumper needs to present themselves to the airflow correctly straight from the exit, practice mentally moving to the door and setting up for a well-executed exit.

28.3.4 Dive flow

- Focus on your own performance and remember good altitude awareness. Remember that the velocity is greater than in belly to earth position.
- Keep your orientation across the jumprun.
- If you lose control of your body position, recover to “ball position” to avoid sudden changes to velocity (19.1).
- Hold on to the agreed upon break-off altitude.
- Even when jumping alone, practice break-off.

28.4 Check-dive

During check-dive student proves that he/she can work as an independent skydiver and knows how to work from ground to ground during skydive.

28.4.1 Actions by student

Prepare the load as a responsible person on the load.

- Be responsible of your gear.
- Choose and plan safe jump.
- Determine the exit order.
- Determine the jumprun and exit spot according to winds.
- Determine direction for landing pattern and instruct other skydivers in the load.
- Brief the pilot before and during the flight.

- Brief the load regarding skydiver related checklists inside the plane.
- Inform on any abnormalities that you or others observe that might have an effect on safety on board or during a jump.
- Spot from the plane.
- Jump the planned jump.
- Fly your canopy safely and land on a planned area

All of the above needs to be done independently, since this point forward, you are an independent skydiver.

28.4.2 Learning objectives

1. You can take care of your gear
2. You can determine landing pattern direction and instruct other skydivers
3. You can determine safe exit order
4. You can brief pilot before and during the flight
5. You can determine good jumprun and exit spot
6. You can plan and execute a jump plan for your own skill level

28.4.3 During flight

- Make sure the plane is loaded in correct order
- Give necessary instructions to the pilot
- Determine the exit spot

28.4.4 Dive flow

Execute the plan. Maintain good altitude awareness. Under the canopy maintain good canopy control and separation to other jumpers, avoid rush during the landing pattern.

	Action	OK	NOK	Notices
1.	Figure out wind conditions			
2.	Announcement to air traffic control, [if done by skydivers] - plane - pilot - altitude			
3.	Gathering the load, others plans, exit order			
4.	Plan for own jump			
5.	Practice the jump, dirt dive			
6.	Instructions to ground personnel			
7.	Gear checks			
8.	Determing landing pattern, instructions to others			
9.	Move to the plane, checks at the plane			
10.	Instructions to pilot - Skydivers - Altitudes - Jumprun			
11.	Loading the plane and instructions for other skydivers			
12.	Actions during climb to altitude			
13.	Check exit spot, instructions to pilot and other skydivers			
14.	Gear check before exit			
15.	Permission to jump, open the door			
16.	Checking jumprun and exit spot			
17.	Actions with the door			
18.	Exit			
19.	Freefall			
20.	Deployment altitude			
21.	Flying under the canopy			
22.	Landing			
23.	Debrief and dirt dive			
24.	Fill out the load report, other necessary tasks			

28.1. Indicative list of things to consider during check-dive.

PART IV – FS GUIDE

29 FS Overview

In formation skydiving (FS) skydivers are performing different formations by taking grips from each other during free-fall. Most common discipline in competitive formation skydiving is 4-way, where the team is formed by 4 formation skydivers, cameraman and one reserve member for the team. In competition the exit altitude is 3050 meters and team has 35 seconds time to perform formations drawn from a dive pool by the FAI skydiving commission (ISC, previously IPC).

29.1 Brief history

1970's

- RW (relative work) is introduced to skydiving.
- 1974 first world cup in South Africa.
- 1975 first Finnish National Championship.
- 1975 first World Championship in Western Germany.

1980's

- 1984 *Mike Zahar* developed first 4- and 8-way dive pool for competitions.
- 1985 Finnish *Skorpions* placed 5th in Wolrd Championship held in Brazil.
- 1986 First official 100-way. Muskogee, USA.

1990's

- 1991 Relative Work becomes Formation Skydiving (FS).
- 1993 Finnish *Madway* -team placed 4th during World Championship held in USA.
- 1993 Finnish national record 57-way.
- 1997 *Max 5* made national record by doing 24 points during competition jump.
- 1997 Unofficial Nordic record 100-way in Oulu, Finland.
- 1999 Finnish national female record 30-way.

2000's

- 2002 French *Meubeuge* made a world record 42 points during competition jump.
- 2003 Finnish *Zooey* placed 8th in female league during World Championship held in France.
- 2004 357-way World Record in Thailand.
- 2005 58-way Finnish record in Kolomna, Russia.
- 2005 35-way Finnish female national record.
- 2006 400-way World record in Thailand.
- 2008 Team *Tigers* made a Finnish national record 26 points during competition jump in Gryttjom, Sweden.
- 2009 Finnish national record 63-way, Empuriabrava, Spain.
- 2010 *Pro-Team* made a national record, 43 points during competition jump. Menzelinsk, Russia.
- 2013 Finnish female national record 42-way.
- 2014 Finnish national record 2 points, 29-way.
- 2015 Finnish national record 3 points, 37-way.
- 2017 Finnish national record, 80-way, Klatovy, Czechia.

30 FS Equipment

30.1 Jumpsuit

During FS -jump, jumpsuit can be effected upon velocity, moving in airflow and taking grips. Material and the size effects on the velocity. Slow jumpers (light and small or long limbs) should wear faster material and faster jumpers should be waring slower material.

Grips in the jumpsuit should be sturdy and big enough so taking grips is easier and more reliable. Usually grips are different color than the other jumpsuit, so they are located easily. For more complex formations jumper might have grips both outside and inside their legs. Most FS -jumpsuits also have booties, that offer more surface thus making moving faster and more efficient during free-fall. Also size of the bootie effects on the performance of the jumpsuit.

30.2 Weight belt

In addition to jumpsuit, jumpers can effect on their velocity by using a weight belt. There are multiple different weight belts on the market where you can adjust the amount of weight accordingly of your needs. Adjustments makes this usually more effective way to balance the differences in velocity. Belt is located at waist, that also helps jumper to arch.

However the added weight needs to be considered with wingload and loading of the plane. Jumper who weights 50kg and adds 6kg weight with a weight belt, makes a 10% difference in their exit weight.

30.3 Altimeter

Most common altimeter is one on jumpers arm/hand. When jumping in group and especially with FS jumping a chest mounted altimeter is a handy tool to have good altitude awareness without changing your body orientation or losing an eye contact since you can look at other jumpers chest mounted altimeter. Also while tracking away after break-off, jumper has line of sight to their chest mounted altimeter, even when the hands are drawn back for sufficient tracking.

To add safety, these days a lot of jumpers uses audible altimeter, that can be set to warn on different altitudes, break-off and deployment for example. However audible altimeter is nothing but an added security, and jumper must not forget to have a good altitude awareness from more traditional altimeter.

30.4 Helmet

During FS jumps it is important to protect your head. Turns might be quite aggressive and sometimes group gets a lot of vertical separation that makes the collision risk higher. There are a lot of knees and elbows during FS jumps, so a full-face helmet adds protection to face.

30.5 Practice boards

If the boards at the dropzone is designed poorly, dirt diving is harder to do. When designing boards for dirt diving, it is important to choose big enough wheels so the moving around is easier. Some padding can also be added on top so it is softer to lay on top.

30.6 Other gear

Taking grips is easier with good gloves. Gloves does not need to be specifically designed for skydiving, but when you are planning to buy one, make sure they are not too big, they have good non-slippery surface and does not effect on your deployment of emergency procedures. Color should be different from the suit colors from the same group, so grips are more visible on the camera while judges are going through the video.

AAD is useful across the disciplines in skydiving.

31 FS Basics

31.1 Eye contact

The most important basics in FS jumping is eye contact. Only way to communicate in the air is by eye contact.

Eye contact also offers a reference point. Most common reason for separation among the group is not using a reference point in the middle of the formation, since your body actively tries to move to the direction of your sight.

31.2 Center point

Jumpers center point is around waist. But the center point during turning might vary according to the turn, for example if turning around a knee. Also every formation has a center point and the formation is built around that point. For example two way star center point is between linked arms. During sequence the formations are built so the center point is about the same throughout the sequence.

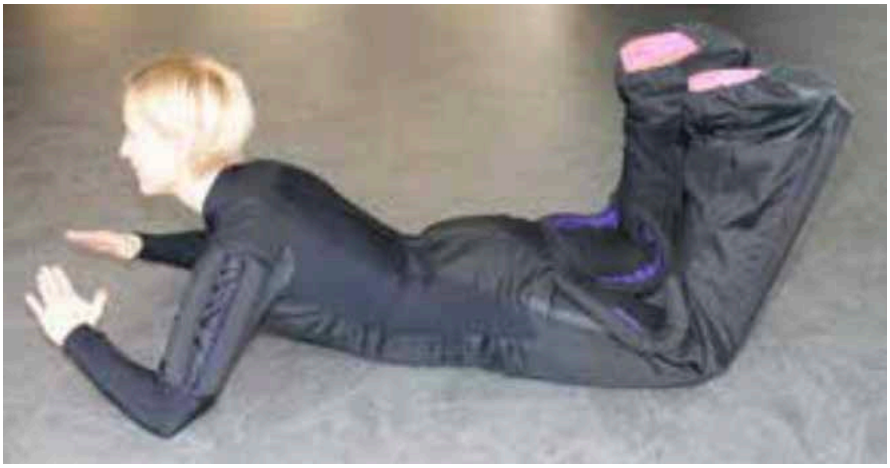
31.3 Docking / Taking grips

While docking jumpers needs to be at same vertical level. Grips are taken from wrist, leg- or arm-grips. Grip needs to be firm, but there should not be any pull on it. Grips are only for short period of time to finalize the formation. After the formation is complete, grips are released and the next formation is starting to build up. Grips are not for holding on to the formation, and every jumper still needs to actively fly their own slot and be ready to move towards the next formation.

31.4 Basic body orientation

In FS jumping the lowest point of the body is waist by maintaining good arch. Legs should be extended enough so that the booties are presented to the wind and pressurized. Arms are leaning against the wind, some people even called that the arms are also pressurized.

This position uses airflow sufficiently, and even small inputs can be used to change your position in the formation. Also taking grips is easier, since your arms are in front of your body.



31.1. Basic body position in FS.

31.2. Example of legwork in FS.

31.3. Example of handwork in FS.

31.4.1 Basic body orientation practices

Good way to practice FS basic body orientation is to lay on the ground, elbows on the ground, chest and head elevated (picture 31.1) and legs bent from the knees. This can be used also to practice turns (pictures 31.2 and 31.3 and more info in chapter 38.2.1), to get simultaneous movement between arms and legs to the muscle memory. All 2-way jumps are excellent practices for basics.

31.4. Sidebody.

31.5 Safety

Some safety related things to consider:

Before the jump:

- Is the weather suitable for your skill level?
- Is your skill level suitable for the dive plan?
- Check your gear and maintain it. Always check your loop that it is tight and in good condition!
- Calculate the effect of weight belt to your wingload.
- Wear the belt on top of your jumpsuit and make sure the buckles are easily accessed and released if you have a water landing for example.

In the plane:

- If the plane is new to you, make sure to check all the features it has for skydiving. Emergency tools and -exits, stall point and how to manage the door.
- Act according to instructions.
- Check your gear.
- Check your friends gear.
- Make sure you know the exit spot.
- Prepare for safe exit.

During jump:

- Make sure there is enough exit separation between groups.
- If linked exit is unsuccessful, locate other jumpers in your group.
- Be aware of other jumpers at all times to avoid collision (especially on bigger formations)
- Altitude awareness!
- Track sufficiently during break-off.
- Check surroundings before deployment.
- Deploy at planned altitude.

Under the canopy:

- Prepare for off-heading opening.
- Check your gear.
- Locate other jumpers in your group and make sure they deployed successfully.
- Be aware of other jumpers under the canopy
- If you cannot make it to the planned landing area, spot for reserve landing area early enough.
- Obey the landing rules during landing pattern.

32 Dirt diving

32.1 Planning the jump

Jump should be well planned before and there should be enough time to practice the jump on the ground prior to boarding the plane. Essential part of the planning is the goal of the jump, what is the learning objective and what skills are improved. When planning the jump the skill level of all the jumpers involved needs to be considered. Good goals are for example body position, moving or maintaining eye contact. Camera perspective is always useful for going through the jump and evaluating if goals were met. FS jumping is based on basic skills of skydiving, and even from the most complicated FS jumps one can find skills that are learned already early on in student program. There is no shortcuts and speed might not always be your friend.

32.1. 4-way dirt dive standing up

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32.2 Dirt diving standing up

Practicing standing up and walking through the jump helps everyone know and remember the planned dive flow, different formations and all grips through the jump. Repeat as many times it takes everyone to remember and successfully walk through the flow. This is easy, sufficient and physically non-demanding way to practice the jump.

32.3 Exit practicing

Exit is depending on the size of the formation and the type of the aircraft. But in any case the exit needs to be simultaneous and presented correctly to the relative wind to be successful. Simultaneous is achieved by counting the exit when everyone is ready at their own positions at

the door. Count should be planned before the jump and executed in same way in the plane. For example on jumper starts “ready”, where others join in to “set-go”; shake for “ready”, inwards movement for “set”, outwards movement for “go”.

Correct body orientation with belly to the relative wind secures a stable and good flying position straight out the door. If simultaneous count or correct presentation to the relative wind is not successful, exit will not be successful. Exit should be walked through as much as rest of the dive flow, since successful jump begins from a successful exit. Climbing out to the exit positions and count can be practiced at the plane while it is on the ground or a mock-up plane if the dropzone has one. Mock-up should be as close as possible to the real door of the aircraft that is being used. Remember, you can exit only once per every jump and there is no trying again, so pay attention to exit practices.

32.4 Practicing with boards

Practicing on the ground with boards is for more detailed practicing of transformations between formations and movement with others. One transformation is practiced multiple times in a row until everyone is clear from where and how they should move to the next position for next formation. Goal is to plan the transformations to be as sufficient and with least amount of movement possible. Once those transformations and grips are planned well on the boards, they can be put together as a complete dive flow. On top of the transformations it is easier to actually see the grips and positions, eye contact and who decides to break the formation to move to the next one.

32.2. 4-way dirt diving with boards.

Moving with boards should be realistic compared to the actual jump, and it is necessary to practice as many times that it takes everyone to be clear with the plan, if there is confusion on the ground, there will be confusion in the air. After practicing with the boards, you should practice at least once standing up before boarding the plane.

32.5 After the jump

Dirt diving should be done also after the jump. Did you achieve your goals for the jump? Even partially? What was missing? What was good and what can be improved?

While going through the video, watch the video as a whole, and break it down to parts after the initial viewing. From the video you can see if the practiced transformations from the boards worked as they should work of should they be improved. Video gives you tools to work on improvements for your next dirt dives.

The goal of dirt diving after the jump is to find problems found during jump and to find those things that should be worked on both dirt diving before jumping and on the actual jump. One important part of dirt diving after the jump is to find everything that went well and remember how it was done. Every jump has something that went well.

33 Free fall practicing

33.1 2-way jumping

Combining different 2-way formations you can make a lot of different kind of diverse jumps. You can either work together or take turns in practices. The one who is staying stationary, can practice good body orientation and try to be as stable as possible so the other can have a steady reference point. Especially at the beginning it is recommended to take turns in practicing, when skills develop, more complex exercises can be introduced. Good way to start building up more complexity to jumps is to add more formations and increase turns and change directions.

Student FS-program can be used for planning, since it offers skills that are the foundation of FS-jumping and these skills can be seen even in the higher level of practicing. FS-program for inexperienced skydivers is also a good tool to plan practicing jumps.

33.2 Break-off

Break-off altitude is agreed upon always before boarding the plane and it needs to be planned accordingly to the skill level and amount of jumpers. It is important that break-off altitude gives enough time to every jumper to gain sufficient amount of separation to other jumpers, with inexperienced jumpers involved the break-off should be higher, around 1500–1600m, and can be brought down once the experience and tracking skills improve. Pretty standard break-off altitude for FS-jumps is 1350m (4500ft, “four and a half beebs”).

Everyone is responsible on altitude awareness and break-off. Once at break-off altitude, wave your arms across in front of your head, turn and track away. Audible altimeter can be set to remind about the break-off, but you should never trust your audible. Always carry and follow also more traditional altimeter.

33.3 Tracking

After initial break-off signal turn away from the center of the formation and start tracking away. The goal is to track as flat as possible to gain most amount of separation to the rest of the group with the least amount lost altitude as possible.

Flat track:

- Move your feet closer to each other and straighten your legs.
- Move your arms to the side of your body, palms down.
- De-arch and roll your shoulders forwards.
- Chin to the chest.
- Body should be stiff.
- Control your heading with your palms.

Stop the tracking by returning to basic body orientation. After the forwards movement stops, check your surroundings, show a clear opening signal. Opening signal is essentially same than break-off signal. If someone is close to you, lower altitude has the right to deploy first.

34 Mental training

34.1 Visualizing the jump

Since skydiving is hard to practice on the ground and free fall time is so short, mental training becomes even more important. The purpose is to visualize the jump exactly like it is planned. There is no right way to mentally practice, everyone needs to find their own way of visualizing and mental preparation. Common ways to practice is to visualize the jump from first perspective, and/or from the camera angle where you can see the whole formation.

You can start preparing mentally once the formations are chosen for the next jump. Training on boards will help you visualize the movements between formations for visual training, transformations might be hard to visualize without actually seeing them on the practice boards. Mental training should be done until the next jump is clear and works in your mind. If you have confusion with the jump, you should try to clarify them by dirt diving more, since if the jump is not clear to someone, the confusion probably will transfer from the ground to the actual jump. During the climb to the altitude, you should go through the jump couple of times in your mind, as a reminder and not so much as a learning.

34.2 Brainlocking

Brainlocking is a common term amongst skydivers. When a skydiver freezes and forgets what was the next action, it is called a brainlock. Usually brainlocks are for a short time only, and is caused by for example hypoxia, lack of sleep, rush, low blood sugar, not enough practicing or wrong mental picture about the jump. By taking these things into account, you minimize the possibility of a brainlock.

35 4-way FS

35.1 Gathering a team and setting up goals

When putting up a team, things to consider are skill levels, goals, ability and willingness to practice. Skill levels can vary amongst teammates, but that needs to be considered while setting up goals. By setting up a common goals for entire team you are maximizing the results for entire team. Good goals are for example taking part in a competitions, point average, having fun together or even long term, more serious practicing.

On top of the common goal there might be individual goals for every member of the team, for example improve basics in body orientation.

A team doesn't require skilled individuals to be successful, it requires equal commitment and adaptivity to work as group towards a common goal.

A good team spirit is one of the biggest factors in building a successful and long-lasting team. Setting appropriate common goals and working together to achieve them forms a good foundation for a team.

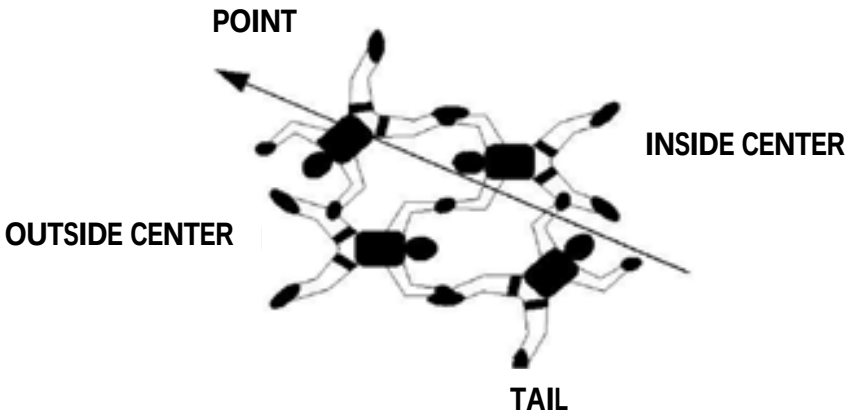
35.1. 4-way team during freefall with cameraman (part of the team).

35.2 Team members

Each member has a dedicated slot and task. Team can be divided roughly in two, "the centers" and "the wings". Center role requires precision and accuracy. Center determines the central point of the formation, around witch the wings work. The wings need to work quickly and flexibly in relation to the center. If the center is not accurate, it makes the distances longer for the wings.

35.2. 4-way exit.

Tasks are determined by exit positions:



35.3. 4-way team exit positions.

Inside center

- Forms a center of control together with outside center. Breaks up most of the formations.

Outside center

- Longer transformations between formations and bigger turns than inside center, breaks up some of the formations.

Point (Front diver)

- Can't see everything, has to rely on touch feeling rather than sight.

Tail (Rear Floater)

- Most of the time facing towards the center.

Video

- Takes a video of the jump for judges or feedback purposes.

Reserve

- Fills in if necessary, needs to be familiar with all the positions.

Usually when the group is broke down to smaller subgroups for blocks or verticals (some of the members goes under of others), outside center and point forms a one group (front block) and inside center and tail forms the other (rear block). Most of the transformations between blocks require subgroups. In some cases the transformation is done by one individual member and rest three is in a group.

35.3 Coach

It is wise to get a coach already when the team is put together. Usually coach can help avoid common mistakes and problems early on. Coach should also be considered to be in line with the skill level of a team. Inexperienced teams require coach that can explain basics, and techniques for randoms and block-transformations. Coach gives feedback from the videos, plans practice jumps and offers guidance during dirt diving. Experienced coach can offer a proper direction for practicing and solve problems amongst team-members that the team cannot solve by themselves.

36 Practices for inexperienced FS-jumper

36.1 FS-program

2- or 3-way practices, for example speedstar practices:

- Levels.
- Maintaining the center point.
- Maintaining eye contact.
- Taking grips.

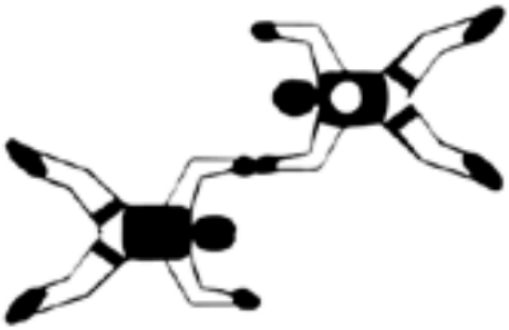
2-way practices

- Star- and sidebody-exit practices.
- Skydivers guide FS-jumps 5 (90 degree turns), 6 (180 degree turns), 7 (360 degree turns), 8 (movement sideways).
- Sidebody with simultaneous 90 degree turns.
- Star – Open accordion – Compressed accordion – Open accordion – Star (same to other side).
- Work in turns: Open accordion – Stairstep.

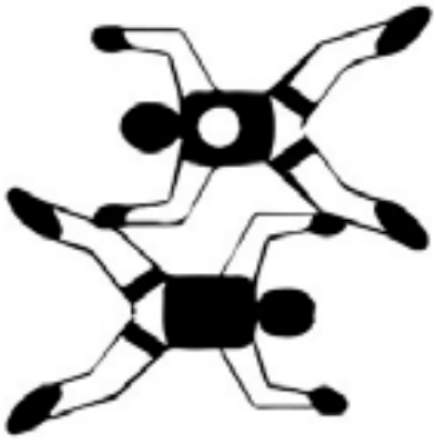
3-way practices

- Star – Open accordion – Star (switch slots in open accordion).
- Star – Donut – Compressed accordion – Star.
- Star – Arrowhead – Star.

36.1. 2-way star.



36.2. 2-way open accordion.



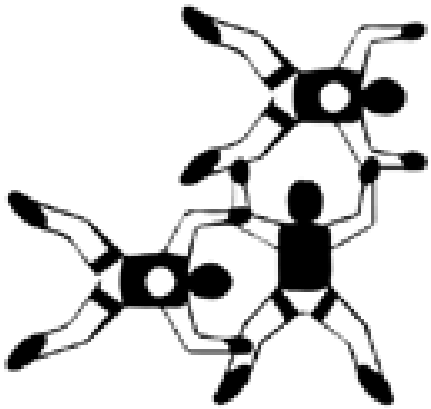
36.3. 2-way compressed accordion.

36.4. 2-way sidebody.

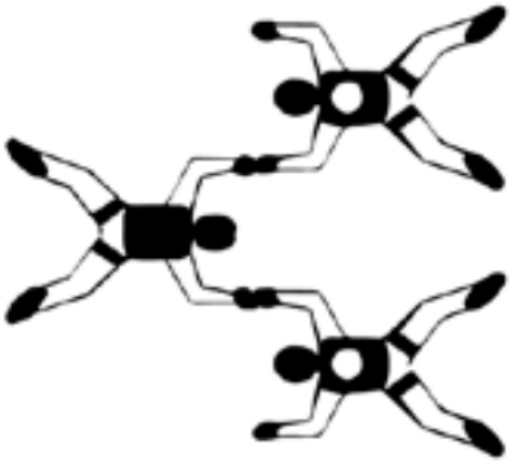
36.5. 2-way caterpillar.

36.6. 2-way stairstep.

36.7. 3-way star.



36.8. 3-way sidebody.



36.9. 3-way open accordion.

36.10. 3-way compressed accordion.

36.11. 3-way donut.

36.12. 3-way arrowhead.

37 Bigway

Bigway (over 16-way) jumping is slower by nature. Exit, forming the formation, approaching, flying in formation and break-off is different from smaller formations.

Exit happens without grips, with small amounts of grips (in base) or the formation “climbs” to the actual planned formation from the exit formation. Exit in bigway needs to be tight and fast to avoid bigger separation between jumpers within the formation right after the exit. Formation needs to be planned in a way that jumpers can approach the formation without flying across the formation.

Bigways can be divided in sectors and formation is approached from your own sector from higher altitude “from the stadium”. Bigway always starts from the base, and it starts to build and expand from there.

Moving around in a big formation is slower than in smaller formations. Once you reach your own slot and take a firm grip, you need to keep flying actively your own slot.

In bigger formations the break-off happens in sequence. Outermost jumpers start tracking away before the center. This way everyone gets enough time and space to gain sufficient amount of separation for deployment. Only way to make sure there is enough free space around jumpers is to track well and far enough.

37.1. Finnish National record 80-way. Picture by Jussi Määttä.

38 Wind tunnel flying

This particular part about wind tunnel flying is meant to introduce newcomer skydiver to wind tunnel practicing. However it is not a complete guide to safety and technique. Keep it fun, but safe out there!

There is another tunnel flying guide in the freefall -section of this book and the introduction might seem pretty similar to this one (thank you *Heidi Lindewall*!), since the basics are really similar regardless of discipline. Both guides are written as their own separate portions of this book.

Big thanks to *Pro-Team* to provide FS discipline specific expertise. Thank you!

38.1 Getting started and safety

38.1.1 Why practice in a wind tunnel?

Wind tunnel flying in general has become more popular in the past couple of years since these days they are more accessible and common. More often skydiving students visit a tunnel during their student program or even before their first jump.

Practicing in a wind tunnel offers a level of intensity in the training freefall skills that is just not possible in the sky. Walls and net offers a static reference on effects of different body positions on flying. If you are for example drifting or moving to a planned direction, you will notice it right away. This offers significant advantage when practicing flying skills.

Modern style of FS-flying might be frustrating and hard alone in the sky if you don't have necessary knowledge and support to learn it. It is also impossible to get expert feedback solo jumps. Down side of this is the risk of learning wrong or insufficient techniques, while in the wind tunnel practicing with a coach from early on offers much more cost effective way to learn.

Wind tunnel practicing also becomes much cheaper way to practice compared to a free fall time in the sky. You can also get more repetition in the wind tunnel, since the time is not as limited as it is while jumping out of a plane, when you have around one minute time to practice, when in the tunnel you can practice for a longer period of time, and one day offers opportunity for much more practicing.

Coach can help you in real time in the tunnel and correct your mistakes. Also after the flying coach can review your video and give you instant feedback right after flying.

Even though it is possible to successfully develop your flying skills at the sky, most often it is vastly quicker in the tunnel. When done right, tunnel flying is safe and sufficient way to practice your skills and it helps every flyer no matter the skill level. Flyers who are aiming to bigger competitions, tunnel flying these days is practically mandatory.

That being said, it is important not to forget practicing jumping also in the sky, since the tunnel does not completely replace actual skydiving. Even though it gives good basics and tools to practice actual skydiving, it does not some safety skills that are essential during skydiving, such as

spotting, exit -practices, taking other skydivers into account, approaching formation and breaking off. And only way to practice safe skydiving under a canopy is to practice it while actually skydiving. These skills should be practiced bit by bit by moving from a smaller formations to bigger ones, even though you might have tens or hundreds hours of tunnel experience.

38.1.2 Who can fly in the tunnel?

Basically anyone can fly in the tunnel. Regular customers who doesn't have any previous experience from skydiving or flying experience are often referred as "tourists" or "rookies". More experienced flyers, "pro-flyers" can buy tunnel time with cheaper prices. Pro-flyer status is depending on the tunnel policies, usually certain amount of skydives or a course offered by the tunnel will grant you pro-flyer status. All flyers starts flying with a tunnel instructor, and often even pro-flyers has a coach with them in the tunnel.

38.1.3 Why do you need a coach?

Good coach will help you get the most of tunnel practicing. Coach also helps you with general questions and practical things. Even though coach is taking a fee from coaching, most tunnels will give some discount when you're flying with a coach.

If possible, coach should be chosen by your own goals. For example if you want to practice FS, then you should choose a coach that is specialized in FS. Once you get more experience, you will notice that different coaches can teach different things, and it is important to find a coach that can teach desired skills so that you will learn them easily. You can ask for suitable coaches from the tunnel, or from more experienced flyers / skydivers.

38.1.4 Booking flights / coach

Usually 15-30 minutes of flying time is booked for the first times flying. FS practicing is usually divided in to 15 minute sets, and between sets there is longer brake for feedback and resting. Within the set the time is divided in for example 1,5 minute slots, and between those slots you have short break and you can watch the last flight from a screen inside the antechamber.

Let's say coach has booked 15 + 15 minutes time for you. Flights are in 12:00–12:30 and 14:00–14:30 sessions. On both sessions you will fly 10 times 1,5 minutes and between every flight you have 1,5 minute break.

Usually coach pre-books the flights for the students, and takes care there is rotation available. Rotation means that there is at least one other student rotating flying with the same coach while student takes those small breaks.

38.1.5 Prices

Tunnel time prices varies between tunnels, usually also between weekdays and time of day. Costs has been past years around 300–700€ per hour. This usually doesn't include coaching. Cheapest flights are usually during office hours and nights. If an hour costs 500€, and coach takes 150€ per hour, one minute costs about 11€.

38.1.6 Schedule

You should arrive to the tunnel well before your flight starts. That gives you an opportunity to take care of possible paperwork (waiver) and payments and change clothes.

Coach gives you a briefing before your flight and goes through practices. If you're flying for the first time, make sure you have at least an hour time for your briefing.

Depending on how much you book time, but usually your time is divided between two different sets, and between sets there is an opportunity to go through with the coach what happened on the first session, find tools to improve and more exercises. Make sure you have time for also de-brief after the last session of the day.

38.1.7 Learning form the video

Take a USB -stick with you to the tunnel so you can take the videos with you. Some tunnels also offers online downloads for videos, but this varies between tunnels. Ask from your coach or from the reception before arriving to the tunnel.

Video is important tool to learn. When you watch videos (your own or someone else) at home, you can physically practice movements your coach has shown you to improve your muscle memory, also mental training is important part of learning. This way you can take the most out of tunnel practicing.

Watching others fly and coaches teach is also good tool to learn, and the best part is that it's free! You can find a lot of videos about tunnel flying online.

38.1.8 Gear

Suit and helmet

Normal FS -suit and full-face helmet works in the tunnel the same way it does in the sky, so you don't need anything special for the tunnel. However your helmet can't have anything attached to it that can cause a hazard if stuck on the net. Camera mounts can be taped if they cannot be removed for tunnel sessions.

Knee- and elbow pads

Knee or elbow might hit painfully a wall. By wearing pads for your knee and elbows you can prevent hurting yourself and others, since while flying with other people some formations and transitions might require quite aggressive flying and knees and elbows might hit other flyers. Good pads are soft and they fit under your suit. They should not limit your movement. You can ask tips and suggestions from more experienced flyers.

Gloves

Wearing gloves is completely up to you. They do protect your hands from scratches from the net and from the airflow. In competitions grips might be more visible if you decide the color correctly. There is not too many reasons why not to wear gloves. Most tunnels sell their own gloves, but you can use pretty much any well-fitting gloves.

Weight belt

If you wish to wear weight belt in the tunnel, you should wear it under the suit. You should also check from the tunnel instructors that they approve that specific belt for tunnel. It should be designed in a way that it is not possible it to break in the tunnel.

Other gear

You should reserve some technical wear under your suit, since much like in any other sport you might sweat while flying and technical wear moves the sweat away from your skin. Whatever you have under your suit should be appropriate to the temperature. Depending on the tunnel, during summer it might get hot and during winter it might be surprisingly cold.

Neck and longer hair also should be considered. Common protection for hair/neck is tube -shaped scarf (“puff”). Especially longer hair might be tangled after a tunnel flight if not protected.

38.1.9 Tunnel functions and safety

Tunnel features and differences

There are multiple wind tunnel manufacturers making tunnels, so there are different kinds of tunnels. Size, height of the wall and the maximum wind speed might be different between tunnels. Air flow is usually slightly different between tunnels, but usually only more experienced flyers will notice this. Best tunnels has constant airflow without turbulence, and door does not cause changes to wind speed when flying near the door.

Most of the tunnels are 14ft tunnels (about 4,2 meters) and that is enough for practicing 4-way FS. There are bigger tunnels available, in Europe there is couple 16ft tunnels and Abu Dhabi has the biggest tunnel in the world, 32ft (9,75 meters).

Usually skydivers are practicing in so called closed tunnels, where airflow is generated with powerful engines. Flight area is separated safely from other tunnel structure with for example net. Usually the tunnel is wider in the top part of the tunnel for safety, this causes the wind to lose speed so flying to the top is hard or impossible.

Tunnel staff

Flight instructor is trained employee of the tunnel. Depending on the tunnel most common certifications are either International Bodyflight Association or Tunnel Instructor.org organized certification courses. Instructor flies with first timers or is responsible of the safety while pro-flyers

are practicing. There should always be an instructor present in the tunnel while flying. Instructor makes sure no one hurts themselves while flying, in practice this means that he might need to spot flyers that are practicing difficult drills while flying.

On top of the instructor that is physically in the tunnel, there is another employee who is observing flying. That other employee usually sits outside of the tunnel and is responsible for adjusting the wind speed and observing that everything works.

Coach

Unlike instructor, coach might not have certificate training for tunnel. However some of the coaches might have had instructor training at some point, especially with freefly -coaches.

Most popular coaches has years of experience with flying, but important thing to remember is that even experienced flyers might not be good coaches. Usually coaching skills develop over time, so you should check the coaches experience before booking time so you will know what you are paying for.

While in the tunnel

Before you enter the tunnel, check that you don't have anything extra in your pockets and remove jewelry and anything that can detach and fly in to the tunnel. Perform a gear check so everything is worn correctly and nothing is broken. Anything that can detach (visor, shoe, glove, part of a weight belt) can harm the tunnel and cause a hazard. To antechamber you can bring your own bottle but keep it far away from the tunnel entry. Make sure you have removed your audible altimeter from your helmet. Inside the tunnel the noise is dangerously loud, so always wear earplugs.

Wait your own turn in the antechamber, allow previous flyer(s) to exit the tunnel completely and wait for permission from the instructor or coach to enter the tunnel.

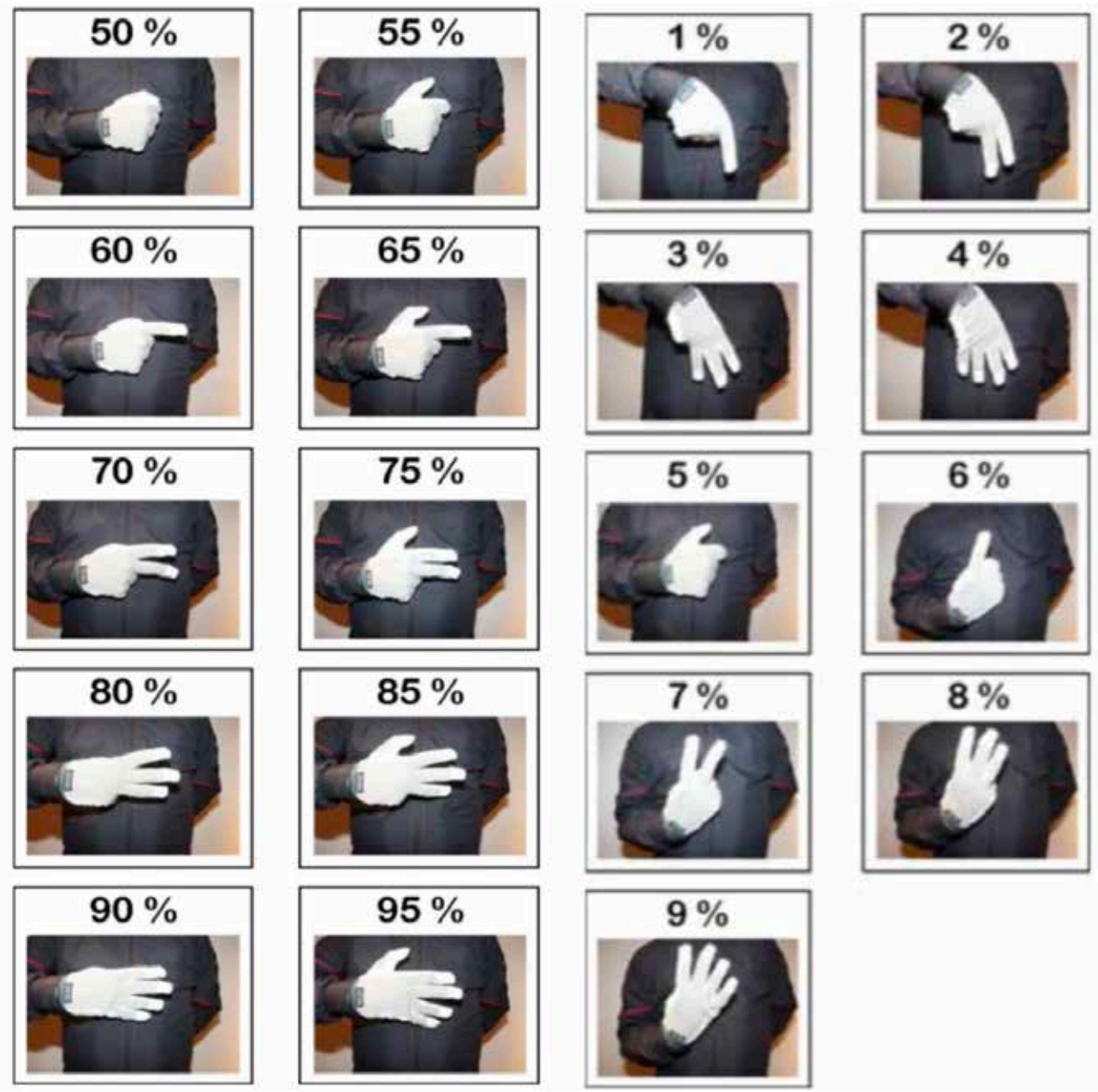
Tunnel lights starts to flash 10-15 seconds before your turn ends, calmly more towards the door and exit the tunnel. Instructor or coach will assist if you have problems exiting the tunnel.

You can have a break between flights and sit in the antechamber and watch your previous flight from a monitor in the antechamber. This is good time for coach to give you feedback and give briefing for the next flight.

Adjusting the speed

You can adjust the wind speed by communicating with the person who is driving the tunnel with simple hand signals (see picture 38.1). When flying with coach usually the coach adjusts the speed for the student and student does not need to worry about this. At latest when you're starting to practice on your own, you should learn how to adjust the wind speed. Please note there might be differences in hand signals between tunnels.

Speed is usually represented in per cents (%). Naturally there are differences between tunnels and especially between manufacturers. For belly -flying usual speed range is for example between 55-75% depending on the size of the flyer. You can ask from instructors what is a usual belly-flying speed with that specific tunnel and what are the hand signals used there. When you're giving hand signals to driver, show them clearly and maintain eye-contact. Double check the speed from the screen before entering the tunnel.



38.1 Wind speed is adjusted by hand signals to the driver. Horizontal fingers (or rarely downwards 10-40) is set how many tens of per cent is desired, and after that fingers are shown vertically either upwards or downwards to set ones. Thumb is for five.

38.2 Basic skills and exercises

38.2.1 Basic skills and techniques

Basic orientation

FS-flying basic orientation is formed by the following parts:

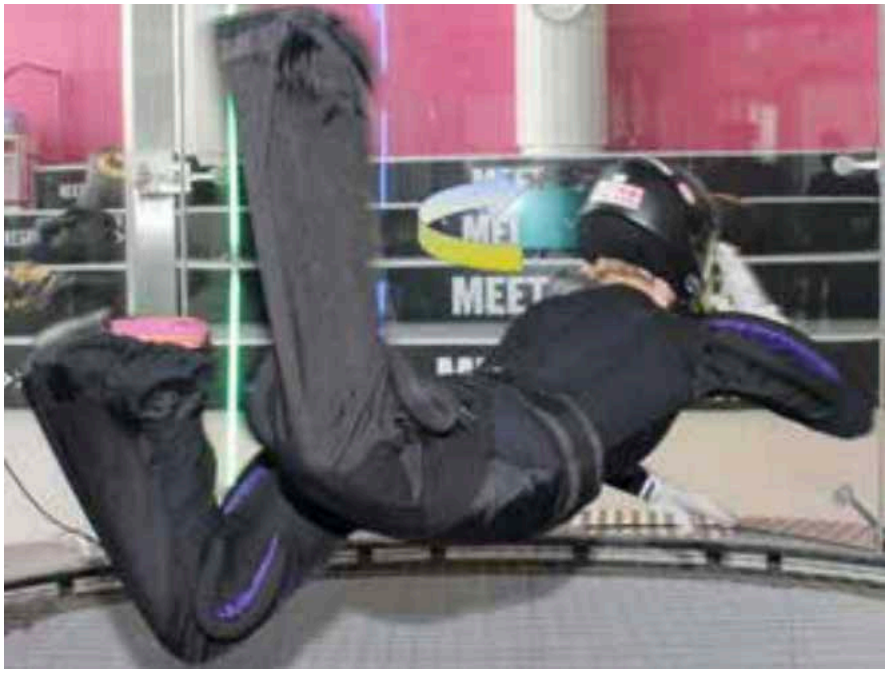
- Pelvis down (arch).
- Arms pressurized (lean in to the airflow).
- Booties pressurized (lean booties to the airflow).

38.2. Basic orientation from the side.

38.3. Basic orientation from the front.

Turning

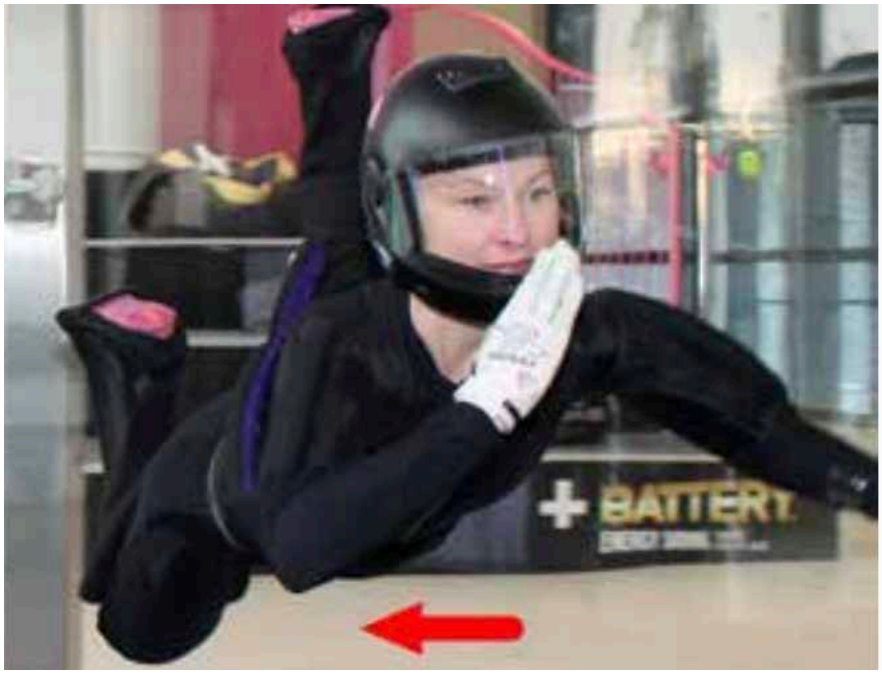
You perform a turn by starting the movement, then by letting your body cruise in basic orientation and then brake to stop turning when desired amount of turning has been achieved. For example turn to right (clockwise): You start turning by putting your left knee down and by raising your left elbow (38.4). Return to basic orientation and let the turn roll. You stop turning by doing a counter movement: put your right knee down and right elbow up.



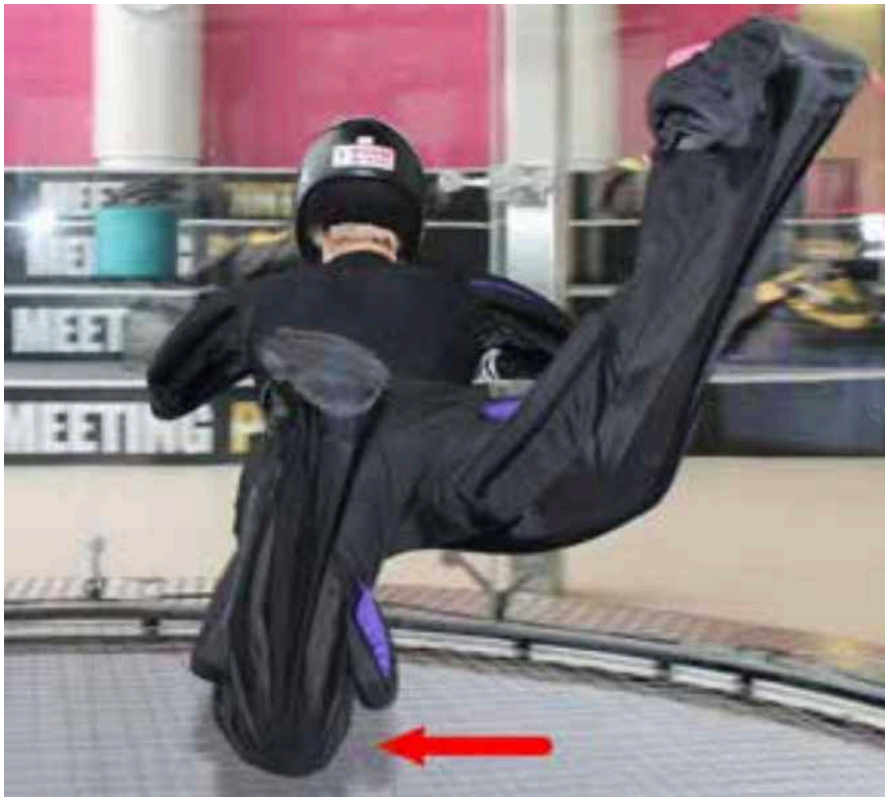
38.4. Turn.

Moving sideways

Movement to the right (sideways) is done by pressing right knee down and raising your left elbow (38.5), keep this body position until you want to stop and stop by doing counter movement by putting your left knee down and raising your right elbow. While moving sideways keep your spine straight, maintain good arch and try not to pivot your body.



38.5. Movement sideways from the front.



38.6. Movement sideways, leg orientation.

Moving forward

During FS jumps you move forward by using your arms. Rest of the body should be oriented normally but arms are turned to a downward-sloping direction, then airflow will “pull” you forwards. On top of that you can slightly give pressure with your legs by stretching them out. You stop the forward movement by tapping your knees together and slight raising your arms to

upward slope (counter movement). While tracking away after a break-off, you should use your legs to full extent by stretching them out all the way including toes, bring your arms to the side and straighten your body (remove arch).

38.7. Movement forward.

Moving backwards

You move backwards by pushing your knees together (see 38.8). You can turn your arms slightly upward-sloping direction to power up the motion. You stop the movement by returning to basic orientation and slightly pressing your arms to downward-sloping direction and extending your legs (counter movement).

38.8. Movement backwards.

Moving upwards

When you want to slower your speed or in other words to move upwards in relation to other jumpers, you want to add more surface area on your body. In practice this happens by extending your arms and legs simultaneously. Arms should be held close together and head is pushed down so the upper body is pressurized well. Arms are practically over your ears (see 38.9). While legs are extended, you can also turn your toes little bit outwards, so you get all the surface area from your booties in use (see 38.10). You stop breaking by returning to a basic orientation.

38.9. Movement upwards.

38.10. Movement upwards, "all in".

Moving downwards

When you want to speed up your fallrate, in other wards move down in relation to other flyers you want to add arch. If arching more does not speed up your fallrate enough, you can bring your arms and legs closer to your body to remove surface area in relative wind (see 38.11 and 38.12) and bringing your chin up. You stop accelerating by briefly taking the same body position you have when you break (counter movement) and then returning to basic orientation.

38.11. Movement downwards.

38.12. Movement downwards, braking already started.

38.2.2 Setting up personal goals

When you are planning your tunnel flying it is important to set up your goals according to your general goals with flying. Are you interested in competing or are you practicing only for fun? Coaches has a lot of drills up in their sleeve for different purposes: for example some drills are meant for bigway -jumping where others for much faster 4-way -jumping. Goals naturally might change on the way, but you should still talk to your coach about them so they know where to guide your practicing.

38.2.3 Flying with your coach

Before entering the tunnel coach explains upcoming drills and practices, their purposes and guides you to correct body movement. When flying with coach he/she is usually present in the tunnel and flies with you and shows you correct examples in practice. Coach might also help you by standing on the net and correcting your body orientation physically while you are flying. This is fast and good way to learn to fly correctly.

38.2.4 Practicing on your own

When flying without a coach in the tunnel there is still the tunnel instructor present and you can and should ask tips for safety from the instructor. You can start practicing without a coach after you can fly on your belly, enter and exit the tunnel safely.

38.2.5 Practicing in a group

Once your skill-level gets higher, it is fun, beneficial and cost effective to start practicing in a group and share your time with flyers with similar skill-set. This way you get more repetition with same amount of time if you can use half a tunnel for your drills. However you need to be in a level you can fly while taking others in to account. Even when flying with a group, you can use a coach to

speed up your progression. Coach can also make judgement who can enter tunnel at the same time safely.

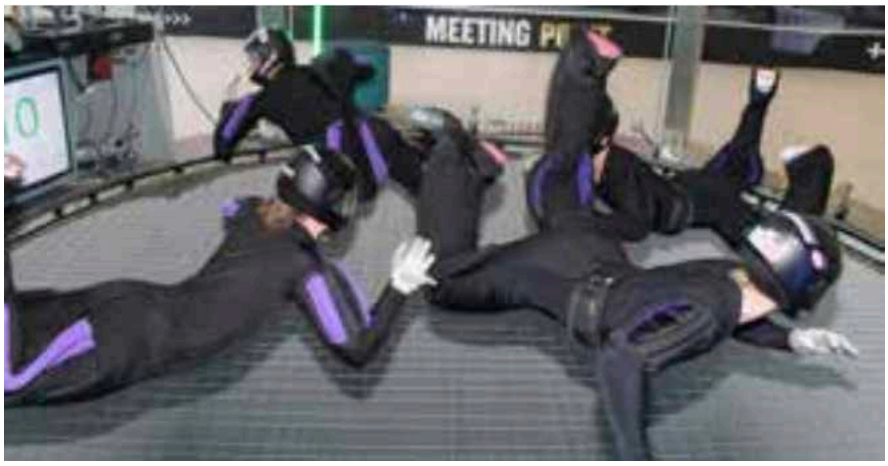
When flying in group you need to be able to fly your slot on same level (altitude) than others. This might seem difficult at first, so at first there should be easier drills to develop these skills.

38.2.6 2- and 3-way -practicing

In chapter 18.9 you can find a program to practice with pair that can help with developing skills for FS -flying also in a tunnel. Also in chapter 36.1 there is 2- and 3-way jumping program that can be done in a tunnel.

38.3 Competing in a tunnel

In tunnel competitions there is 4-way and 8-way series. The size of a tunnel limits especially 8-way competing, but also in a 4-way dive pool there is some deductions since there is not enough room to perform all the blocks. More information and rules can be found in FAI website.



38.13. 4-way team during competition.

38.4 Useful links

International Bodyflight Association: https://tunnelflight.com – Events, news, tutorial videos.

Tunnelinstructor.com: www.tunnelinstructor.com/course-material/ – Tutorials for instructors and for those who want to become one.

I**ndoor Skydiving World**: www.indoorskydiving.world/wind-tunnel-locator/ – Events, news, competitions, info about different tunnels.

Indoor Skydiving Source: www.indoorskydivingsource.com – Tunnels around the world on a map and much more.

FAI, World Air Sports Federation: www.fai.org – Information about the disciplines and competing across aerial sports.

TUNNELS

Twinwoods adventure: https://twinwoodsadventure.com – Also known as Bodyflight Bedford has been place for Finnish FS -tunnelflyers to practice since 2006.

Bodyflight Stockholm: https://en.bodyflight.se – Good tunnel close.

Fööni: fööni.fi – ISG-tunnel in Helsinki.

Aeronautica Arena: aeronautical.fi – Formerly known as Sirius Sport resort in Pyhtää. (Aerodium).

39 FS 4-way practicing and competing

39.1 FS 4-way practicing categories

This section is targeted to jumpers who has an elementary understanding FS 4-way competing. Therefore it is narrower and has a lot of terminology without further explanation.

FS 4-way practicing can be categorized in 4 categories:

1. Physical training.
2. Mental training.
3. Technical training.
4. Tactical training.

39.1.1 Physical training

From these categories only physical training can be considered individual training when executed. In planning phase it should be considered a team training. Developing physical abilities the need comes from the team, not from the individual.

It is important to define all the strengths and development areas for each individual depending on the team roster. For example specific speed strength, motoric skills or even stamina training. Strengths and development areas are defined by physical testing.

The goal of testing is to define all physical requirements for FS 4-way training. 4-way competing nowadays is a combination of speed strength and motor skills. Training also requires stamina.

Example of testing pattern:

- Different muscle strength tests (sit-ups, press-up, curls etc.).
- Fat percentage and BMI to define body composition.
- Bicycle ergometer to define stamina (MaxVO2).
- As a speed test for example stationary long jump.

By these tests a test plan can be created to develop physical abilities. Team roster, development areas and schedule of training camps should be considered.

39.1.2 Mental training

Mental training can be divided between personal mental abilities (pressure handling in competition situation, focus, mental training etc.) and teams mental abilities (for example team dynamic).

Personal mental abilities there is a lot of different ways to practice. Key goal also in mental training is to find development areas and own abilities by different testing methods. Visual training is powerful way to practice. Material can be found from for example “Mental Training For Skydiving And Life”, *John J. DeRosalia*.

Trainings for team dynamic targets same goals to improve:

- Open communication within the team.
- Elevate confidence.

This section also contains different parts of assembling a team and everyday actions for a team. “There is no perfect team”; *Bruce Tuckman’s* 1965 Forming Storming Performing team-development model and article from *Gary Bayer* (dropzone.com) divides the team assembling process in four categories:

- Forming – Stage 1
    - The “honeymoon phase”
- Storming – Stage 2
    - Guess what? The honeymoon is over!
- Norming – Stage 3
- Performing – Stage 4
    - The fun part!

Different meetings within a team helps to solve inevitable problems when multiple people are training closely together, even for weeks at training camps. When there is an opportunity to clear things out when problems arises, the problem does not have an opportunity to grow something that cannot be solved. Different methods are for example:

- Day closing meeting.
- Pass the rock meetings - Meeting to develop team communication. (in this method only one person can speak at a time)
- Training planning meeting including scheduling and financial planning and tracking.

Methods varies depending on team development stage. One way is to make Team training manifest that includes high-level yearly plan and commonly agreed program and goals with actions to achieve those goals.

Visual training means either going through complete jumps mentally or visualizing even individual maneuvers. Visual training is in big part of complete picture, since actual jump numbers are limited. For example teams that are training professionally can do about 1200 team jumps per year and this means around 20 hours of actual jumping training per year. Visual exercises can add amount of training and mental picture of the jump gets faster, in other words “mind has to be faster than body”.

39.1.3 Technical training

Technical training includes both personal flying skills and team technique -training. This portion of training happens mostly in the sky or in the tunnel.

Practicing personal flying skills is most beneficial in the tunnel where there is possibility to do enough repetition. Basic body position / using a reference point, different maneuvers and controlling the airflow and body position in the airflow. Practicing a basic body position key point is balance, dimension and speed (so called FS-aerodynamics). Good basics are foundation for balanced and fast movement. Basic body position has developed in a bit more unstable direction, but on another hand it brings much more reach and speed. Training has to be repeated enough times that it becomes an automation. Then jumper does not need to think in 4-way training how to perform some maneuver. Wind tunnel offers the tool to actually perform sufficient amount of repetition in short time period.

Technical training, 4-way

Technical training for 4-way techniques happens either in the tunnel and/or by jumping. In the tunnel it is possible to do much more repetition than by jumping.
Practicing a rhythm happens on Random -jumps or “Tempo shift” -jumps, where there is for example 3 randoms + 1 block. Block practicing happens early on in so called drill -jumps, where there is 1 block and 1 random. Focus of training is on the block technique, this means to build the first formation of a block always the same way and performing the block inter the most effective and precise way.

AAA/Open division team training is mainly contained by so called b-slot training. In AAA/Open division blocks 3, 5, 10, 12, 16 and 17 causes switches in flying slots. Blocks 3, 10, 12 and 16 switches only another block switch. After blocks 5 and 17 there is so called double slot switching where both blocks change slots and mirror image block -technique. Advantages of double slot switching is that how-to knowledge about block techniques develops faster and there is fewer practicing combinations compared to mirror image block -technique. B-slot training focuses on practicing actions of block pairs in all the formations.

Practicing different kind of jumps

Jumps drafted from dive pool can be categorized in four categories:

- 5 randoms.
- 3–4 randoms and 1 block.
- 1–2 randoms and 2 blocks.
- 3 blocks.

Character of each jump and building the rhythm is different and this has to be considered while preparing.

35 second competition performance divides in two clearly separated portions:

- 10 seconds after exit sub-terminal velocity (exit/hill).
- 25 seconds in terminal velocity (flat).

On average 25% of points is done on the first 10 seconds and 75% during the remaining 25 seconds. Board training and wind tunnel serves mostly the terminal velocity portion of the jump. Tunnel training can be done also while wearing a harness to simulate skydiving even further. When practicing in the tunnel time can be limited to 25 seconds and practice only the terminal velocity portion of the jump, then you can start from for example after the first sequence.

There is only little help for sub-terminal training, but you can use for example:

- Exit simulator.
- Exit to a swimming pool.

In either case the training does not have any relative wind effect on the exit.

In training it is important to consider also type of the aircraft and the exit-speed. If necessary, you can use different camera angles to analyze the performance. Visual training is in vital role in all training weekly.

39.1.4 Tactical training

How to apply tactics in relation to following questions:

- How many different ways is the specific formation performed?
- How many different ways there is to perform specific block?

Continuity plan is the toolbox for the team and tells how many different ways team can perform formations and blocks. Especially at the beginning the toolbox should be kept small and always perform with same way. Long axis means a line through point (front diver) and tail (rear floater). Mostly floaters are positioned on this line and jumpers angle and distance is defined in relation to this line. Blocks usually (but not always) causes this line to shift (axis shift) and after a switch working continues with relation to this new line. These techniques are used when training is in a phase when already jumping randomly selected formation. Clear toolbox helps preparing for competition jumps.

Tactical training happens mostly with boards and exit-simulator. Practices are always executed the same way (PAKSS):

- Puzzle.
- Angles.
- Keys.
- Secret Stuff.

Puzzle – Walking through a sequence slowly while standing up. Here you learn the formations without taking angles into account.

Angles – Angles and transitions between formations, this is performed using boards, and every maneuver is repeated for example three times.

Keys – Who is grabbing and what, and what can you see and feel. This is also done by using boards.

Secret Stuff – Small special tricks that are learned down the road is good to repeat now. Specific block -techniques or specific random-transformations.

After these keep a small visualization break, and after that practice the jump using normal speed that the team could perform it in the air (or in the tunnel). Time limit can be set.

Planning training

Team training manifest works as a spine to plan training. It includes broad level yearly plan and commonly agreed upon program and goals and actions to achieve those goals. Following is an example from Pro-Team Team Manifest contents:

In addition training planning needs measurable goals, for example:

- Physical tests.
- Excel -sheets.
- Exit/hill/flat time goals/results.

PART V – FREEFLY GUIDE

40 Introduction to freeflying

As a discipline freeflying gives possibility to create own style and way of flying in the sky. There is no such thing as wrong way of flying free.

Definition of freefly is very broad. Originally it meant different styles of flying in a way that the spine was straight in relation to the airflow. Nowadays it contains pretty much everything:

- Head-down.
- Head-up.
- Angle (either head up or down, in an angle in relation to the airflow).
- Dynamic, that is combining all above.

Basic idea is to be able to control your own body in different body positions.

There is some things that should be considered before starting practicing. This guide gives you basics on freeflying safety, body positions and basic movement in the sky and/or in the tunnel. This guide helps you to start practicing easily from for example sit-fly. Guidance can and should be asked from more experienced freeflyers and/or your own local freefly coach. They will guide you to a right path. By reading this guide you will not become a master overnight, but it will definitely give you something to start with.

41 Freefly - Body positions

Practicing different body positions is easy to start with the basics already learned in student -program. Before receiving your A -license you have already tried tracking and sit-fly basics. In this section there is more information about them and also information about head-down and angle -flying.

41.1 Angle

Tracking is familiar and used by all skydivers but it is also sub-category for freeflying, when it is called angle -flying (also Atmonauti, tracing, tracking). Good body position offers great horizontal speeds without falling faster. However the horizontal distance travelled is not the point of freefly tracking, the point is to fly in predefined formation with the group. In a tracking group there might be people either on their belly or on their backs. Grips can also be taken while tracking in a group.

Different subcategories of angle flying can be called with various names and they differ from one another by for example the angle related to the horizon. For example flocking is almost in a head-down orientation and more traditional tracking happens in a very low angle. The time in freefall is greater in angle than in traditional freefly jumps. Planning the flying route for the group has the same basic principles than any other moving groups. From the exit order point of view angle -groups can be placed basically anywhere since they are moving away from the jumprun, but if there is multiple groups, then the flight plans needs to be communicated between all the moving groups. Angle can be flown either on a belly or on a back, head-up or head-down. Angle -flying might be hard at first.

41.1.1 Belly to earth

From a normal tracking position you can transform to angle -flying position by doing the following:

- Take a reference point from the ground or when jumping in a group the leader can be used as a point of reference.
- Open chest, press your chin towards your chest and open your arms to the side.
- Straighten or even bend your pelvis - do not arch.
- You can control your vertical and horizontal speed by changing the position of your arms and shoulders. (make a “cup” of your upper body, moving your arms outwards or inwards, backwards and forwards)
- By changing the position of your legs has an effect on your horizontal speed.

It is important to maintain “stiffness” in your body while flying to stay stable. At first it might be easier to control your heading and speed by using your arms and palms, but when your skills improves, you might want to start using your body by changing the angle from your shoulders to your legs.

41.1. Angle body position.

The best body position for every individual can be found by trying out different ways to fly. The best body position depends on for example on the physical size of the flyer. There is also various ways to change speeds and angle, but here is some tips you can try:

- If you want to move downwards, in other words steeper; press your forehead against the airflow and bend your upper body lower in relation to rest of your body. Be careful not to bend too far, or you will be in head-down -position.
- If you want to move upwards, make your tracking position wider and form a “cup” with your pelvis and/or your upper body. Notice that it is important to maintain tracking forwards while changing your altitude in relation to the rest of the group.
- By modifying your body position smaller and more aerodynamic you’re gaining more horizontal speed.
- If you want to lower your horizontal speed you should lower your knees and widen your arms to the sides.

41.1.2 Back to earth

Tracking on your back requires good control of your body. It also requires the ability to fly straight without a target point on the ground. In basic back to earth position:

- Head should be as straight line with the rest of your body than possible. If your head is bent too far back, you will turn to head-down orientation. You still should be able to see the group leader when jumping in group.
- Middle of your body is slightly curved so your pelvis is high (tense your buttocks).
- Legs straight out, press them against the airflow.
- Feet close, almost pressed together.
- Arms below your shoulders.

If body position is not effective, your horizontal speed will decrease while your vertical speed increases. Common mistake is that the back flyer is too far in front and tries to maintain eye-contact with the leader and is bending their head downwards, when the head is raised and pelvis drops down. (see the picture 41.2).

41.2. Back tracking body position.

You can turn to steeper angle by moving your sight steeper in relation to the horizon. Press your head and upper body against the airflow. You can lower your horizontal speed by raising your arms above your body (in front of). This way also offers support when you are transitioning to a steeper angle. Your body should be as firm and straight as possible. You can control your vertical speed by moving your arms further apart or closer to your body sideways.

41.2 Head-up / Sitfly

Freeflying should be start from a head-up orientation. When you can stay in sitfly position and move around without problems, you can start advancing to other orientations, for example head-down. Sitfly position has relatively similar speed to head-down position, but it is safer to practice since it is easier to control without any accidental drifting without noticing it.

41.2.1 Getting in to sitfly -position

Exit straight to sitfly -position is easiest to perform back presented to the relative wind. In other words back towards the direction where the plane is moving. Drop to the airflow and spread your arms and legs simultaneously and try to maintain your position as symmetrical as possible. Keep your pelvis and legs strong, so the airflow caused by the propeller doesn't effect as much. Relax, but remember where the relative wind is coming from and don't let it tip you over.

In freefall you can transition to sitfly from either back fly or from the recovery position (42.7.2) by pressing your feet to the airflow, spreading your arms symmetrically to the sides and turning upwards to sitfly -position. Keep your eyes to the horizon. From belly you can transition to sitfly by pulling your knees to your chest, spreading your arms symmetrically to the sides and leaning backwards. Press your feet against the airflow and lift yourself to sitfly.

41.2.2 Basic sitfly -position

In basic sitfly -position your upper body should be straight upwards, chest opened, shoulder blades almost together and eyes to the horizon. Arms spread to the sides along your chest line, bent from your elbows so your hands are in front of your body. Ankles, knees and pelvis are forming 90 degree angles. Legs should be spread to the sides at least shoulder width, so the chest and pelvis can be utilized for moving around. Shins should not be under your thighs, since legs are bent 90 degrees from your knees. Bottom of your feet are pressed against the airflow. In this position you are falling straight down.

41.3. Sitfly body position.

You can practice sitfly -position by sitting on a chair legs spread out. Keep your back straight and arms spread to the sides. Check the 90 degree angles. When you are looking straight, you should see your palms. While sitting on a chair you'll get a picture what sitfly -position should look like. To get the feeling of what does it feel like remove the chair, lean back against the wall in same position. During jump you'll feel the airflow against your feet the same way you feel the pressure while leaning against the wall.

41.2.3 Moving backwards and forwards

Moving around while sitflying happens with pelvis. When you push your pelvis forwards, you move forwards. You can boost moving by pushing your arms backwards while palms are against the airflow and slightly straightening your legs below the knee. This position is driving you aggressively forwards, and in order to stop the movement, you have to do counter movement to stop. While moving you are also unstable, so it is important to practice it at first with enough separation to other jumpers.

41.4. Moving forward.

By pressing your pelvis backwards and upper body forwards you start to move backwards. For moving backwards the wide spread on your legs is important, since then the airflow has direct access to your chest while you're leaning forwards. If your legs are too close together, it will form a cup between your legs and your upper body, that causes movement also upwards in relation to other jumpers.

41.5. Moving backward.

41.2.4 Moving upwards and downwards

Moving downwards (falling faster), press your legs slightly downwards in relation to your body, and bring your knees slightly closer together. If necessary, bring your legs slightly under your body (close to "standing up" position). While sitflying, you can add speed also by just raising your arms upwards, remember, more narrow body position is less stable to fly.

Moving upwards (slower) spread your legs outwards, present your shins to the airflow and open your arms further away from your body sideways. Pushing your knees closer together while spreading your feet away from each other helps to present maximum surface area to the airflow. For more drastic braking you can use back-fly but be careful not to fly too slow on your back in relation to other jumpers.

41.2.5 What can go wrong?

If you end up on your back:

- You might not have strong enough legs and in correct position below the knee.
- Your arms are too much in front of your shoulders.
- Your back is not straight enough or your posture is not good enough.

If you end up on your belly:

- Your knees might not be in 90 -degree angle and your feet are under your butt.
- Your back might not be straight.

If you're rotating without control:

- Your feet might not be flat and straight under your knees, even slight rotation in your feet causes rotation.
- Your arms and palms might not be symmetrical on the sides and one is higher than the other.
- Your legs might be too close together.

If you end up in a situation described above, take the recovery position and try again.

41.2.6 Turning in sitfly

You turn in sitfly by taking a target from the horizon, then press the arm downwards from the side you want to turn while slightly bringing the arm backwards (rotating your upper body), look to the direction where you are turning while maintaining your sight to the horizon. Your body starts to turn, keep your eyes on the horizon through the entire turn and remember to maintain strong legs all the way, do not bring your feet under your legs. Straighten your upper body and recover your arms to symmetrical position when you want to stop and keep looking to the horizon. Usually turning can be achieved just by thinking about it. You can speed up the turn by making your arms and legs a blades of a propeller, by performing this, the turn is aggressive and more unstable, so when you start learning the turns, use only your arms.

41.3 Head-down

Head down -position has a lot of different styles and combinations of styles. Most important thing when flying head down is to control your own style in a way that it stays in place, you can move where you need to move in different directions, you can stop the movement and that you can be aware of your surroundings while in freefall. You need to have strong basics on head-up before you can start moving towards head-down. If head-down gets out of control you need to be able to

recover quickly to stable head-up position so you don't cause a danger to other jumpers with drastic change of your speed.

41.3.1 Practicing head-down position

The basic style of head-down is called the "straddle" that looks like you're sitting on a horse with your legs spread to the sides. From the front perspective the straddle looks like a falling badminton. You can get to head-down position either from head-up, or straight from exit.

- Spread your legs wide to the side and bend from the knees slightly. Keep your calves presented to the airflow. Try to avoid letting your legs to suddenly swinging either forwards or backwards.
- Spread your arms to the side and keep them low enough that you don't have to tense your shoulders and neck. Palms are facing the sky, arms relaxed.
- Look to the horizon, after couple of jumps the flipped horizon starts to feel natural.
- Keep your pelvis and neck straight in relation to your spine, your whole body should be straight from your pelvis to the top of your head. Balance lightly so your pelvis is straight on top of your head and try to support the position with your legs. Try to be as relaxed as possible.
- Don't arch!
- Remember to breathe, if you feel like nothing is working out, take a deep breath, relax and try again.

41.6. Straddle.

It is easiest to exit straight to head-down position if you climb out the door in a way that your back and your chest is straight parallel to the relative wind. Drop down from the plane straight to straddle and let the relative wind guide you to head-down position. Don't jump and don't present your back or your belly to the relative wind. Don't try to force the horizon to your vision, if your drop from the plane correctly, relative wind will turn you automatically to head-down position and the horizon will come to your vision automatically. Often it is easiest to practice the exit while crossing your hands to your chest so the position turns to head-down more easily. Open your arms symmetrically to the sides once the horizon is in your vision.

Often when starting to practice the body is too tense. Another common mistake is that there is too much arch in your chest and you fly too much with your hands, the goal is to fly mostly with

your legs and pelvis, and then your hands are free to for example taking grips, stabilizing and adjusting the speed.

When you are practicing head-down try to maintain the position for only about five seconds at the time, change back to head-up, turn away from the jumprun and transition back to head-down. This way your speed is staying under control and you can control unintended movement. When you are practicing, always do it face away from the jumprun!

41.3.2 Daffy

While flying head-down daffy is very versatile position. In daffy you can easily change your speed and slot and fly grips. In daffy the upper body is straight just like in straddle, but the legs are in different position. One leg is brought in front of your body. Front leg is bent from the pelvis and a knee and the airflow should be felt in the thigh and a shin. Other leg bent from the knee backwards and the airflow should be felt in the back side of the thigh and calf. Legs should be relaxed and upper body straight, otherwise the position starts to rotate. Remember to breath and relax.

41.7. Daffy.

41.3.3 Shelf

Shelf -position is originally developed in a wind tunnel. There legs are taking the minimum amount of space. Both legs are slightly bent from the pelvis and also from the knees backwards, so it feels like hanging from the calves that are presented in behind.

While learning head-down you'll learn to transition between straddle, daffy and shelf depending on the situation. There is no one correct way of flying head-down. However when starting to learn, you should learn one position at the time and after that start practicing transitioning between them.

41.8. Shelf.

41.3.4 Moving forwards and backwards

Horizontal movement while freefalling is basically the same regardless of position. If you want to move somewhere, there has to be surface area presented to the airflow in the opposite direction. You need to think where the airflow is coming from and where is it pushing you when you move your arms, pelvis or legs in different directions. In head-down even the slightest changes in body position will cause movement horizontally.

For example in straddle movement occurs by using your pelvis and legs. To move forward pull your pelvis backwards, then your pelvis and lower back is presented to the airflow and that starts to drive you forwards. You can help the movement by pushing your legs further back. For backwards movement push your pelvis and legs forwards, so the airflow will push to your lower belly and pelvis. You can help the backwards movement by pushing your thighs to the airflow. You can try movement by just slightly pushing your head to the desired direction.

Horizontal movement in daffy happens by using legs and pelvis. Moving forward happens by pushing the trailing leg to the airflow and pulling the leading leg slightly back. You can help the movement by pulling your pelvis back. Moving backwards happens exactly the opposite way.

When you are moving backwards or forwards your surface area is bigger than in straight downwards moving position, this causes slight speed changes in relation to other jumpers that are falling straight down. To compensate you need to pull yourself to smaller position to lose some surface area.

41.3.5 Moving upwards and downwards

Vertical movement is needed when you for example want to move to same level than other jumpers on the same jump. You can make your speed faster (move downwards) by making yourself smaller, so you need to remove surface are from your arms and legs. Remember to maintain eye-contact with others in your group so you don’t drift above them or collide.

You stop the movement by making yourself bigger again, remember that you need to start this long before you are actually on the desired level compared to for example belly flying. If you don't start braking early enough, you'll end up lower than the rest of the group.

You can slower your speed by adding surface area to your head-down position by extending your arms and legs. Braking using your arms will make flying more difficult, since your arms are not relaxed any more to take grips. More sufficient way to brake is to use daffy position where your legs has more surface area presented to the airflow. Daffy leaves your arms free for grips, but you can also use them to brake even more.

41.9. Turning.

When you try to keep your head on the same level with others in the group, eventually you'll learn to adjust your speed with small maneuvers and you don't need to think about it anymore that much.

41.3.6 Turning while flying head-down

360 turn can be performed by for example using your shoulders and legs. Turning with shoulders causes a small oval spiral while turning with legs turns in place. Turning by using your shoulders is performed in a way, where you take a target from the horizon or from another jumper. Turn your head to the direction where you want to turn and your shoulders turns automatically with your head. Keep your eyes to the horizon to stabilize the turn, to stop turning fix your eyes to the target and return to normal flying position.

When turning by using your legs you still need a target point. Make a small movement with the leg that is going to be leading the turn outwards, and opposite leg backwards. This maneuver lets the airflow to push your legs to the direction of the turn. The amount how much the legs are turned defines the speed of the turn. Keep your eyes to the horizon throughout the turn so you'll stay stable. When you want to stop turning perform a counter movement with your legs before your turn is complete, because when you are turning with your legs it will turn faster and stopping takes more time. Finalize the turn by taking a same level with another jumper.

41.3.7 Grips

Taking grips is not always essential while flying head-down. More important is the ability to fly your own slot. Taking grips should not effect on your flying and flying should not stop once the grip is taken.

Good rule to remember on taking grips is: level, slot, dock! When you start to move towards a grip, you need to be on the same level than the other jumper, after this you move closer horizontally and stop the movement, just before taking the grip is good to fly small while on the grip taking distance without actually taking the grip. When taking a grip is important to focus on your own flying. Don't reach and never hang on to the other person.

When flying in a grip, your arm that has taken the grip should be slightly bent so it is flexible for a small movement. Arm should be below the shoulder level. If you reach for the grip your arm is tense and it will cause pull to the grip. Let the grip go instantly it doesn't feel right. Grip that has a pull on it makes the flying for others more difficult. The grip is good when you can keep it relaxed and light.

41.10. Grips and bigger formation in head-down.

42 Safety while freefly

Freefly jumps has a speed of 240km/h on average, it depends on the position and orientation. This is why your gear needs to be in a good condition. Premature deployment in the middle of freeflying can cause a serious hazard. Higher speed also causes that even smallest maneuvers will cause more accidental movement, so the collision risk is also higher if you don't control your body. Collision in high-speed freefall can harm you or other jumpers badly. In this chapter you will find answers to avoid these dangers while freeflying.

42.1 Gear

42.1.1 Harness / container

Make sure your gear is in good condition. It is recommended that your harness fills the following requirements:

- It needs to fit well. Your harness cannot be too big or loosely worn that the shoulder straps starts to roll over your shoulders or leg straps move towards your knees. In a worst case scenario this might cause you to fall off from your harness while deploying.
- Your chest-strap needs to be tighter than normally and the buckle should not slip. If you have premature deployment, straps that are tighter than normally might save you from falling off from your harness.
- Riser covers on your shoulders protects the risers from the airflow. They should be stiff enough to stay in place. Airflow can for example open your toggles if risers are not protected. Velcro covers are not suitable for freeflying.
- Pin covers for main- and reserve canopy should be stiff and should not open while in freefall.
- Loop on both canopies should be in good condition and the container needs to stay closed while in freefall.
- It is recommended that there is an elastic band between the leg straps. This prevents the leg straps to move away from their place especially when sitflying.
- Bridle should be completely tucked under the closing flaps and not presented to the airflow, so the pilot chute is not pulled out prematurely.
- Bottom of container (BOC) should be tight and in good condition and pilot chute packed correctly, so it is not accidentally pulled out.

During freeflying is not recommended using harness/container that:

- Has a double pin on either main- or reserve container, freefly maneuvers can open a pin or pins.
- Where pilot chute is either in leg strap or in belly band. Freefly maneuvers can cause the pilot chute to get out of the pocket.
- Where bridle is presented to the airflow between pin and bottom of the container. Bridle can pull the container open and cause a horseshoe -malfunction.

Student -gear can be used only with a permission from an instructor.

42.1.2 Other gear

With other gear while freeflying you should consider following things that are either mandatory or strongly recommended:

- Goggles should be in good condition and tightly worn. Airflow is coming from a different direction you are used to, so goggles might fall out of place if not worn correctly.
- Hard shell helmet in case of collision.
- Visual altimeter is mandatory and it is recommended to wear a hand-mounted altimeter. Learn to read it in different positions.
- Audible altimeter is strongly recommended, some uses even two audible altimeters. However don't trust your audible altimeter.
- For camera flyers it is recommended to have a one hand cutaway mechanism for camera.
- AAD is always strongly recommended and mandatory before C -license.
- Avoid clothing that can in any situation cover any of your handles.
- Hook knife needs to be easily accessible, just like in any other discipline.

42.2 Exit

Recommended minimum exit altitude for freeflying is 3000m. When exiting above 3000m there is time to do maneuvers in freefall and still have time for safe breakaway.

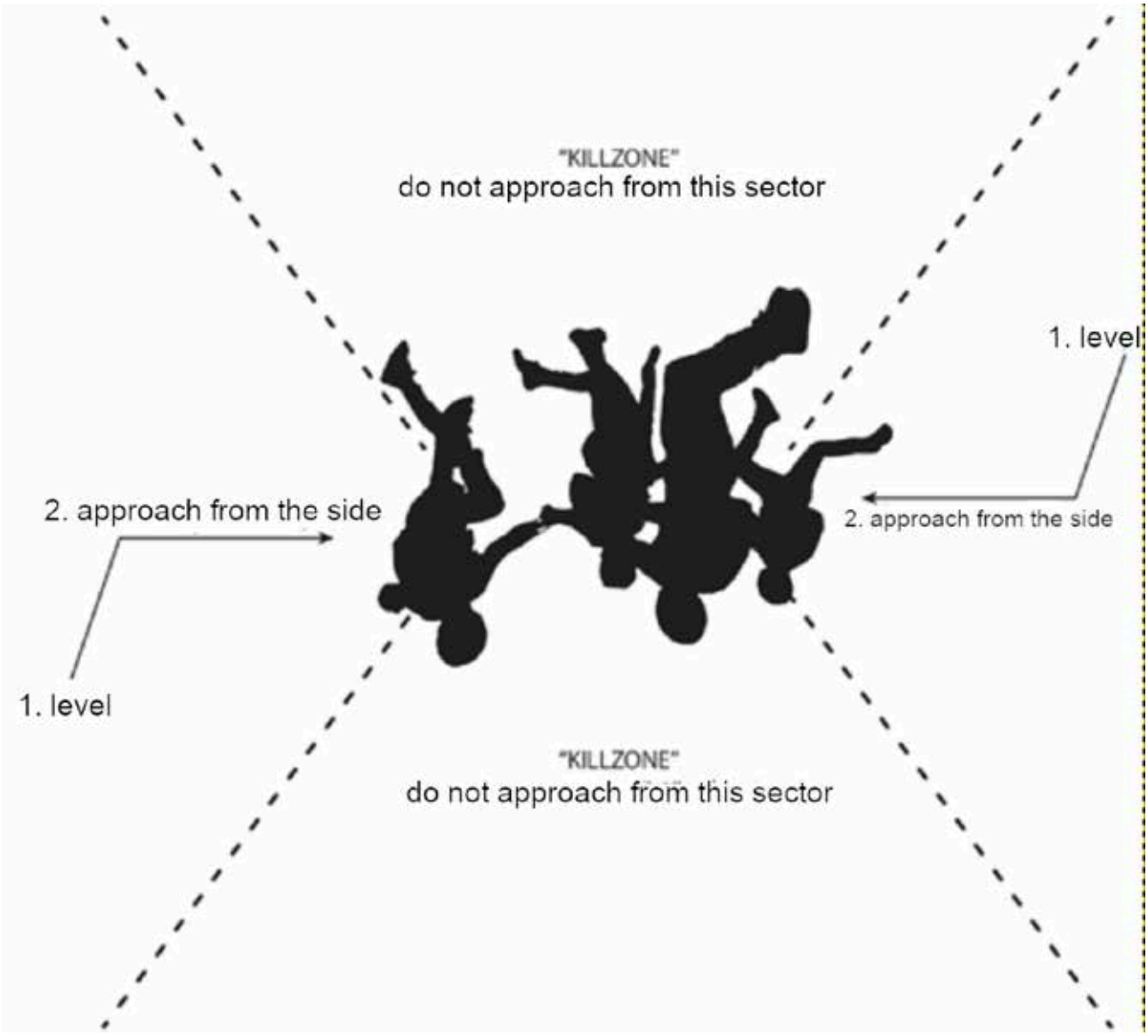
Recommended exit order is that first will exit belly flying groups and then freeflyers. Moving groups are last ones from freeflyers. Belly flyers exits first, since they are drifting the most while in freefall in relation to jumprun. Exit order might vary between dropzones, so remember to check the local policy. If the upper winds are strong, it is essential to leave good separation between groups in order to avoid drifting under or over another group.

In freefly exit there is often grips from another jumpers limbs or clothing, plan and practice the exit in a way that there is no possibility for anyone to accidentally pull for example reserve handle from another jumper.

42.3 Freefall

It is important to note that during freeflying the speed is much higher compared to belly flying, because of that also the horizontal movement is bigger if jumpers accidentally drifts during freefall. Just like in any other discipline the altitude awareness is very important, note that in freefly jump the freefly time is only 45-55 seconds compared to belly flying where the time is 60-70 seconds when exited from 4000m.

Try to perform all practices and maneuvers across the jumprun no matter if you are jumping in a group or alone, this prevents you from drifting under or over other jumpers or groups during freefall.



42.1. Approach formation from safe direction.

While jumping in group, try to maintain visual contact with everyone in the group. Practice to fly straight in head-up and head-down orientation. Try to prevent vertical separation within the group. Discuss with your group and decide a “base” for the jump. The base is a single jumper that decides the speed of the jump and try to maintain your speed according to the base. Missing base might cause greater vertical separation between jumpers that causes dangerous situation during break-off.

Do not jump in a group that is too big for your skill-level. It is not shameful to sit out from a jump that is out of your league instead of joining a jump that is out of your league and ruin the jump for others or in worst case cause an injury for another jumper.

If you end up above or below your group, move horizontally away from the group while maintaining eye-contact to the group and take a correct level to the group and approach the group from the same level from the side. Never approach freefly-group from above or below the group!

Approaching from the side prevents high-speed collision, if someone unexpectedly loses control below you. Learn a proper bail out position (ball) to avoid high-speed collisions.

Try to avoid clouds while freeflying, however if you end up in a cloud, try to maintain eye-contact with the group. If you lose the eye-contact to the group try to fall in place. Do not turn to belly since someone might be above you. Once you are clear from the cloud, check the airspace and depending on the altitude either break-off or fly back to the group.

While tracking either solo or in a group, always plan the break-off place and spot for deployment in a way that is clearly away from the jumprun. Never plan the tracking route along the jumprun or close to another group!

42.4 Collision during freefall

Avoid at all cost colliding with another jumper. You can avoid collision by for example taking a ball position well before the collision occurs, this usually stops undesired movement that is driving you to collide with someone. Avoid at all cost colliding especially head first, so if collision is going to happen, try to protect your head and collide with your body. After collision check yourself, other jumper and your gear, if you notice that something is wrong, break-off and prepare to deploy.

42.5 Break-off and post deployment actions

Break-off signal and altitude has to be planned before boarding the plane, this way each jumper can adjust their audible altimeters correctly. Break-off altitude should be planned according to the skill level and the size of the group. If you don't know where everyone is at break-off it might lead to collisions while deployment, so it is important to break-off at the same agreed upon altitude.

Rule of thumb: When there is more jumpers on a jump, break-off should be planned higher altitude. Examples for break-off altitudes:

- 2–4 jumpers, 1400m
- More than 4 jumpers, 1500m
- More than 8 jumpers, 1600m
- More than 12 jumpers, 1700m or more.

Before break-off altitude try to get everyone in sight. If you can't see everyone right before break-off altitude, make a 180 degree turn in place and try to find missing jumpers. After that track to a free area for deployment.

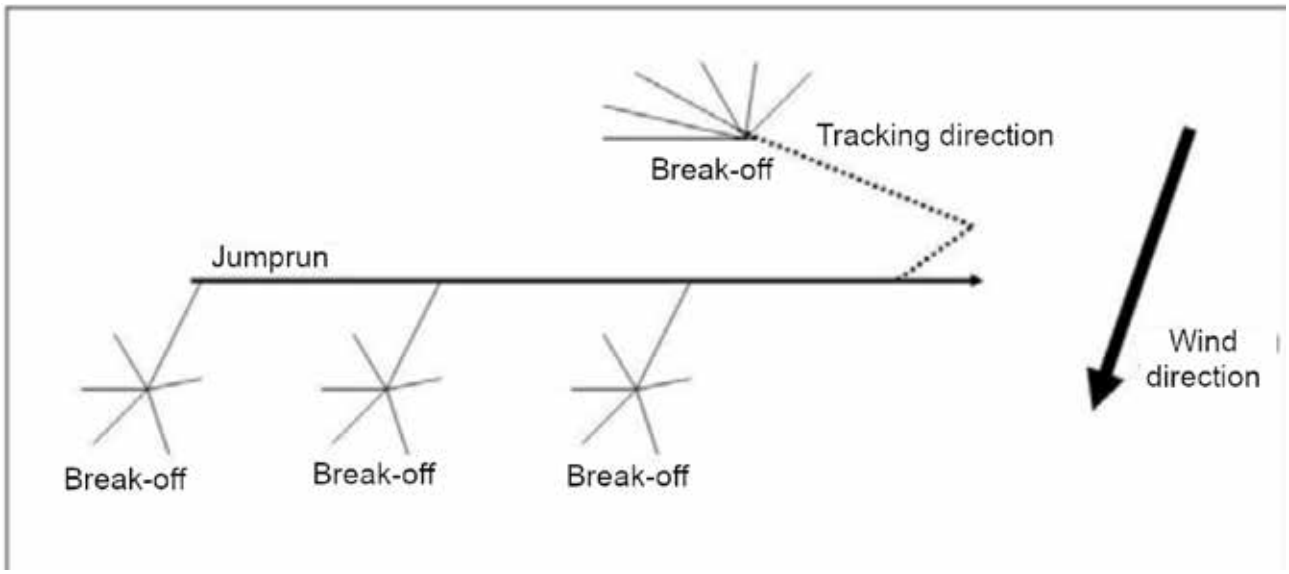
While sitflying it is important to gain separation to the group after a break-off signal. Back carefully away from the formation and only then turn away to track. If you are too close to another jumper there is a risk of you kicking them when turning to track away. However be also aware while backing away since there might be someone behind you.

During head-down jumps there is two different ways to break-off. Change your angle slightly to your belly side so you start tracking away, use this method only when you are absolutely sure there is no one behind you. Perform a barrel roll while tracking to make sure there is no one above you.

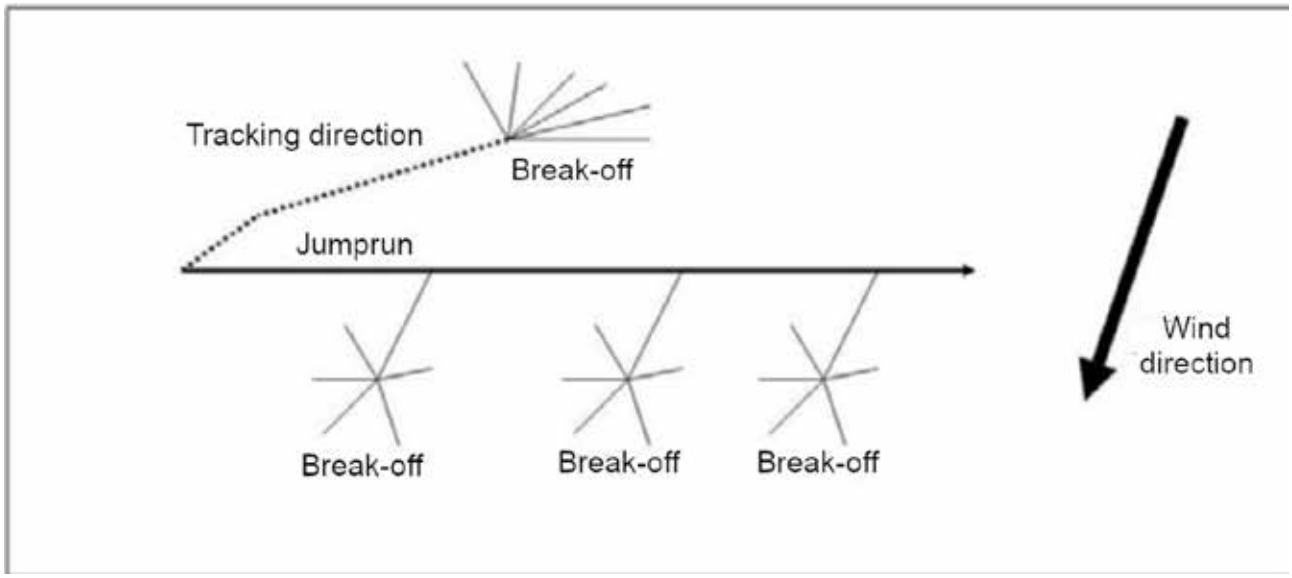
Practice mid-tracking barrel rolls on a solo jumps, it is important that your heading doesn't change during the roll.

Second and recommended way is to make a controlled 180 degree turn after the break-off signal away from the center of the formation. Then start slowly turning your head-down to your back and track on your back for a while to check the airspace above you, turn to your belly when you have a good separation to the rest of the group and deploy. With this method the altitude awareness is important, since the turn and back-tracking takes time and altitude.

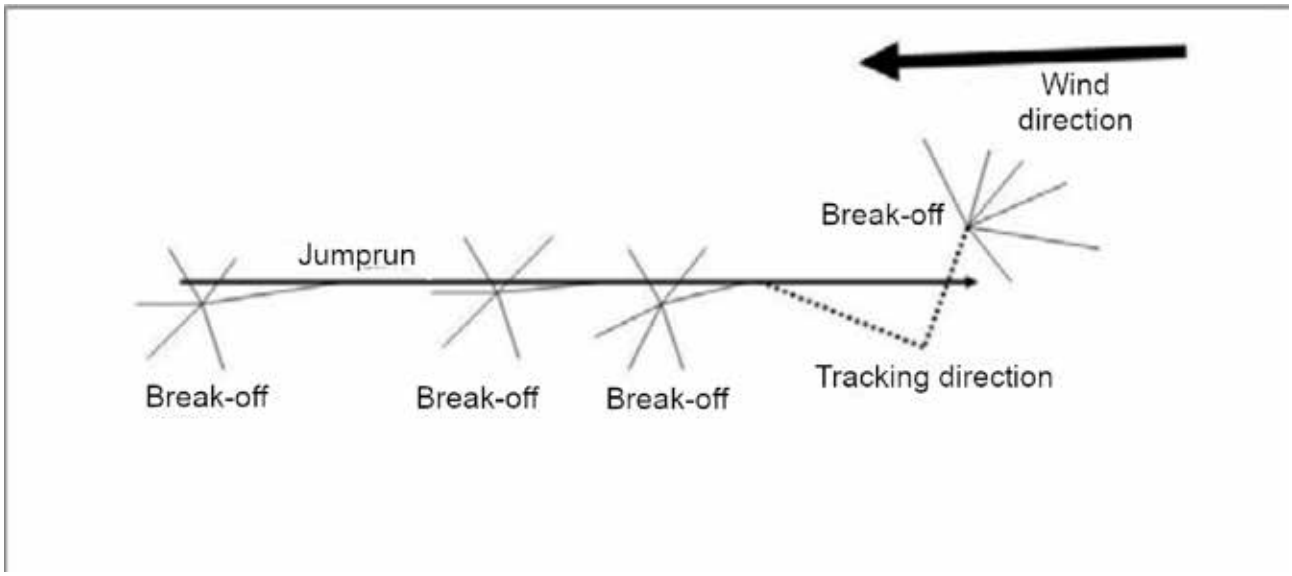
If you notice someone below you close deployment altitude, check the airspace above you and deploy right away. If that person below you is already deploying or you see an open canopy below you, try to track away past it or to the side to avoid collision.



42.2. Tracking group exits last.



42.3. Tracking group exits first.



42.4. Tracking group exits last while flying in to the wind.

After deployment check the airspace and turn away from the jumprun by using your rear risers. Turn to the landing area only after you have seen canopies from the groups that jumped before and after you. This way you might avoid collisions.

42.6 Angle-tracking planning

When you start planning an angle jump you should have current wind information available. Make the plan according to the current wind conditions before the jump and don't plan on tracking too far. If clouds prevents you from navigating, don't jump tracking jumps at all. The basic idea is to make the plan in a way that after deployment you are in an upper wind in relation to the landing area and you get enough separation to other groups in the same load (see pictures 42.2-42.4). When deciding a direction, take possible emergency landing areas into account as well. During tracking jumps there should always be a leader who makes sure the group stays on the planned path. The leader should be more experienced tracker. Directions can be taken from for example terrain, plane or the sun. When using terrain it is beneficial to be familiar with the area. Back-trackers can use the plane as a reference at the beginning, this also helps if there is some clouds.

Tracking groups are usually placed at the end of a jumprun and sometimes also in the beginning. Always make sure you know if there is other moving groups and make plans with other groups together to avoid collisions. Solo-tracker might be placed also in the middle of the jumprun, solo should always track straight away from the jumprun.

Break-off altitude is always planned before boarding the plane. Consider the size of the group. If the winds are strong and group is tracking far away, plan break-off to higher altitude.

By default tracking jumps the break-off is higher than other jumps (1600-2000m). During break-off each jumper starts to track to pre-planned direction, usually slightly away from the center to the side. Imagine a highway ramp that you start to exit the highway. Do not make over 90 degree turn unless you are absolutely sure there is no one behind you. If you cannot maintain the speed of the group and you are left behind, start tracking away early and far enough, but stay far away from the jumprun! This is always planned before boarding the plane.

42.7 Safety terminology

42.7.1 Cork

If you hold a cork below the water and let it go, it will jump to the surface. Corking is universally used term used to describe an uncontrollable change of speed and loss of control during a high speed jump (for example from a head-down to belly). The speed is around 200km/h on belly and usually over 240km/h during freefly. If jumper corks, there is serious danger to collide with another jumper above with such a high speed that it might cause a serious injury or even death.

42.7.2 Recovery position / Ball position

In case of loss of control it is important to practice maintaining the speed even when the body position changes. Good way to do so is a ball position. In a ball position your legs are bent, thighs against your chest, back curled and hands towards your toes. Airflow should hit your lower back. You can stabilize the position by extending your arms to the side especially when planning to transition back to sitfly. You can practice the ball position while laying on the ground on your back and lifting your arms and legs. Practice this while jumping before moving towards head-down practicing. You need to be able to maintain your speed either from a ball position to sitfly or even better straight to sitfly, where you have better control of your movement. Also you are more aware of your surroundings in a sitfly than on your back.

42.5. Recovery position.

42.7.3 Drifting / zooming

When you start practicing freefly, you move unintentionally a lot. Especially during head-down practicing the movement might be really aggressive and even borderline tracking in a steep angle. You can ask more experienced jumper to jump with you who can tell you if you are drifting to some direction.

42.7.4 Orbiting / carving

Orbiting occurs when two jumpers are moving closer but does not stop the forward movement. When they pass each other the change the heading but the forward movement keeps happening.

Body tends to turn to the direction of sight and movement turns with the body and jumpers starts to rotate around imaginary center.

You can stop orbiting by stopping and taking a static point from the horizon, if another jumper still moves, don't follow and perform a controlled 90 degree turn when you lose the line of sight. Find a new point from the horizon and try to stay in place. Orbiting is not a big risk especially when jumping in a 2-way groups. In a bigger groups it might cause problems, and it is important to be able to stay put when starting to jump bigger formations.

43 Freefly competing

Term freeflying started to be popular in early 1990's, when freestyle world championships 1993 *Olav Zipser* and *Mike Vail* won gold with their team Freefly Clowns. After this the term has been combined with modern style of freefly. Soon after Freefly Clowns won, freefly started having own competitions for teams with 3 members.

Freefly has two disciplines, artistic freefly is the older one and vertical formation skydiving (VFS) is newer and in fact is part of formation skydiving. In this chapter we will introduce both.

43.1 Artistic Freefly

There is 3 members in a freefly team, where 2 members are artists and third is a videographer. In official competitions there is 7 rounds, where 2 are mandatory and 5 free rounds. During free rounds team performs their designed program in different orientations and judges evaluates them in a scale from 0 to 10.

For evaluation judges observes technical difficulty, artistic perspective, camera work, big picture, variety and teamwork. When planning the routine, team should focus on for example that there is clear beginning and ending for the routine. Also it is important to use the whole available time effectively and there is variety and imagination in the movement. Jump should be aesthetic and enjoyable to watch. Good performance form artists is not enough, if the camera work is not successful. Good videographer keeps the artists in the middle of the frame throughout the jump, uses different angles, light, and clouds well in the video. Exit altitude is 13000ft (about 4000m), the time to perform is 45 seconds.

Mandatory rounds have the same exit altitude. During these rounds there are four different compulsory sequences, sequences are announced in advance. Team try to perform these sequences fluently and transitions between them are also evaluated. The goal is to combine these compulsory sequences in to one artistic routine.

43.2 Vertical Formation Skydiving

VFS team has 5 members, where one is a videographer. The goal is to jump predefined 4-way formations that are built with combination of head-up and head-down orientations. There is 8 rounds in competitions and there is 3–5 predefined formations. The goal is to perform these formations as many times as possible in correct order. Exit altitude is 13000ft (4000m) and time to perform is 35 seconds. Evaluation happens from the video and judges are calculating points (grips) and whoever has the most combined points from these 8 rounds wins.

44 Tunnel flying

This tunnel flying guide is meant to introduce a new jumper to the tunnel practicing. It is not meant to be used as a complete technique guide or safety instructions. Keep it fun, but safe out there!
Big thanks belongs to *Heidi Lindewall* and everyone who commented the script for this guide. Thank you!

44.1 Why fly in the tunnel?

Wind tunnel flying in general has become more popular in the past couple of years since these days they are more accessible and common. More often skydiving students visit a tunnel during their student program or even before their first jump.

Practicing in a wind tunnel offers a level of intensity in the training freefall skills that is just not possible in the sky. Walls and net offers a static reference on effects of different body positions on flying. If you are for example drifting or moving to a planned direction, you will notice it right away. This offers significant advantage when practicing flying skills.

Especially freefly-practicing (head-up, head-down, moving around, angle) alone can feel difficult and frustrating at first in the sky if the flyer does not have the necessary information available for developing the skills. The risk is that flyer might learn “wrong” techniques that are not so effective or are harder to perform. If practicing starts in the tunnel with a coach and early in the skydiving career, flyer does not have the opportunity to learn bad habits.

Wind tunnel practicing also becomes much cheaper way to practice compared to a free fall time in the sky. You can also get more repetition in the wind tunnel, since the time is not as limited as it is while jumping out of a plane, when you have around one minute time to practice, when in the tunnel you can practice for a longer period of time, and one day offers opportunity for much more practicing.

Coach can help you in real time in the tunnel and correct your mistakes. Also after the flying coach can review your video and give you instant feedback right after flying.

Even though it is possible to successfully develop your flying skills at the sky, most often it is vastly quicker in the tunnel. When done right, tunnel flying is safe and sufficient way to practice your

skills and it helps every flyer no matter the skill level. Flyers who are aiming to bigger competitions, tunnel flying these days is practically mandatory.

That being said, it is important not to forget practicing jumping also in the sky, since the tunnel does not completely replace actual skydiving. Even though it gives good basics and tools to practice actual skydiving, it does not some safety skills that are essential during skydiving, such as spotting, exit -practices, taking other skydivers into account, approaching formation and breaking off. And only way to practice safe skydiving under a canopy is to practice it while actually skydiving. These skills should be practiced bit by bit by moving from a smaller formations to bigger ones, even though you might have tens or hundreds hours of tunnel experience.

44.2 Shortly about tunnel flying

44.2.1 Who can fly in the tunnel?

Basically anyone can fly in the tunnel. Regular customers who doesn't have any previous experience from skydiving or flying experience are often referred as "tourists" or "rookies". More experienced flyers, "pro-flyers" can buy tunnel time with cheaper prices. Pro-flyer status is depending on the tunnel policies, usually certain amount of skydives or a course offered by the tunnel will grant you pro-flyer status. All flyers starts flying with a tunnel instructor, and often even pro-flyers has a coach with them in the tunnel.

44.2.2 Why do you need a coach?

Good coach will help you get the most of tunnel practicing. Coach also helps you with general questions and practical things. Even though coach is taking a fee from coaching, most tunnels will give some discount when you're flying with a coach.

If possible, coach should be chosen by your own goals. For example if you want to practice freeflying, then you should choose a coach that is specialized in it. Once you get more experience, you will notice that different coaches can teach different things, and it is important to find a coach that can teach desired skills so that you will learn them easily. You can ask for suitable coaches from the tunnel, or from more experienced flyers / skydivers.

44.2.3 Booking flights / coach

Usually 15–30 minutes of flying time is booked for the first times flying. freefly practicing is usually divided into 10–15 minute sets, and between sets there is longer brake for feedback and resting. Within the set the time is divided in for example 1,5 minute slots, and between those slots you have short break and you can watch the last flight from a screen inside the antechamber.

Let's say coach has booked 15 + 15 minutes time for you. Flights are in 12:00–12:30 and 14:00–14:30 sessions. On both sessions you will fly 10 times 1,5 minutes and between every flight you have 1,5 minute break.

Usually coach pre-books the flights for the students, and takes care there is rotation available. Rotation means that there is at least one other student rotating flying with the same coach while student takes those small breaks.

44.2.4 Prices

Tunnel time prices varies between tunnels, usually also between weekdays and time of day. Costs has been past years around 300–700€ per hour. This usually doesn't include coaching. Cheapest flights are usually during office hours and nights. If an hour costs 500€, and coach takes 150€ per hour, one minute costs about 11€.

44.2.5 Schedule

You should arrive to the tunnel well before your flight starts. That gives you an opportunity to take care of possible paperwork (waiver) and payments and change clothes.

Coach gives you a briefing before your flight and goes through practices. If you're flying for the first time, make sure you have at least an hour time for your briefing.

Depending on how much you book time, but usually your time is divided between two different sets, and between sets there is an opportunity to go through with the coach what happened on the first session, find tools to improve and more exercises. Make sure you have time for also debrief after the last session of the day.

44.2.6 Learning form the video

Take a USB -stick with you to the tunnel so you can take the videos with you. Some tunnels also offers online downloads for videos, but this varies between tunnels. Ask from your coach or from the reception before arriving to the tunnel.

Video is important tool to learn. When you watch videos (your own or someone else) at home, you can physically practice movements your coach has shown you to improve your muscle memory, also mental training is important part of learning. This way you can take the most out of tunnel practicing.

Watching others fly and coaches teach is also good tool to learn, and the best part is that it's free! You can find a lot of videos about tunnel flying online.

44.3 Gear

44.3.1 Suit

You can usually manage at first with your skydiving suit well enough to get at least started. If you don't own one, you can usually borrow/rent a suit from the tunnel. When you start flying a lot in the tunnel, you should get your own suit that fits well.

Different manufacturers and materials and special requirements set by the discipline would make a complete guide by itself, so the best way to get help with suits is to ask from your coach or more experienced flyers. In general, suits for tunnel freeflying are tight and well fitted so flyer learns to use their body without excess fabric having too much effect on flying. Suits for the tunnel usually are little bit more durable than skydiving suits, so you should check from the manufacturer if the suit can be used in the tunnel.

44.3.2 Helmet

Just like with the suit, you can get started with your skydiving helmet (and possibly goggles), but after your training progresses, it might become beneficial to get own helmet to use in the tunnel. For safety reasons many freeflying tunnel flyers uses full face helmets, even open face helmets are still popular in the sky.

Helmet used in the tunnel cannot have anything that can attach to the net, scratch the wall or harm other flyer, such as camera mounts. Usually small add-ons can be taped if they cannot be removed easily.

Usually the helmet suffers some damages in the tunnel for example when practicing head-down in the tunnel. You can protect your helmet by using tape.

44.3.3 Knee and elbow pads

Especially at the beginning you practice either at the net or close to the net. Even though the net is flexible, it might cause some damage. You can also hit your knees or your elbows to the glass. You can prevent bruises or even injury by using pads under your suit.

Best pads are small and they fit well under the suit. They should be flexible and not prevent any movement. You can ask guidance from more experienced flyers. Some suit manufacturers offers as an add-on some protective gear either with the suit or separately.

44.3.4 Shoes

Best shoes for flying is sport shoes. Usually the best choice is well fitted skateboarding shoes with laces and smooth bottom.

There cannot be any hooks or heels in the shoes that can get through the net and they should be fitted in a way that they will not fly off in the middle of flying, even if you stumble on the net. Loose shoe stops the tunnel and usually are not recovered in one piece.

44.3.5 Gloves

Gloves in the tunnel is usually matter of taste. Just like while skydiving. However usually they don’t do any harm and might protect your hands from small scratches.

These days most of the tunnels has gloves for sale, but you can use any well fitted gloves, even the ones you use while skydiving.

44.3.6 Other gear

You should reserve some technical wear under your suit, since much like in any other sport you might sweat while flying and technical wear moves the sweat away from your skin. Whatever you have under your suit should be appropriate to the temperature. Depending on the tunnel, during summer it might get hot and during winter it might be surprisingly cold.

Neck and longer hair also should be considered. Common protection for hair/neck is tube -shaped scarf (“puff”). Especially longer hair might be tangled after a tunnel flight if not protected.

44.4 Tunnel functions and safety

44.4.1 Tunnel features and differences

There are multiple wind tunnel manufacturers making tunnels, so there are different kinds of tunnels. Size, height of the wall and the maximum wind speed might be different between tunnels. Air flow is usually slightly different between tunnels, but usually only more experienced flyers will notice this. Best tunnels has constant airflow without turbulence, and door does not cause changes to wind speed when flying near the door.

Most of the tunnels are 14ft tunnels (about 4,2 meters) and that is enough for practicing 4-way FS. There are bigger tunnels available, in Europe there is couple 16ft tunnels and Abu Dhabi has the biggest tunnel in the world, 32ft (9,75 meters).

Usually skydivers are practicing in so called closed tunnels, where airflow is generated with powerful engines. Flight area is separated safely from other tunnel structure with for example net. Usually the tunnel is wider in the top part of the tunnel for safety, this causes the wind to lose speed so flying to the top is hard or impossible.

44.4.2 Tunnel staff

Flight instructor is trained employee of the tunnel. Depending on the tunnel most common certifications are either International Bodyflight Association or Tunnel Instructor.org organized certification courses. Instructor flies with first timers or is responsible of the safety while pro-flyers are practicing. There should always be an instructor present in the tunnel while flying. Instructor makes sure no one hurts themselves while flying, in practice this means that he might need to spot flyers that are practicing difficult drills while flying.

Driver. On top of the instructor that is physically in the tunnel, there is another employee who is observing flying. That other employee usually sits outside of the tunnel and is responsible for adjusting the wind speed and observing that everything works.

44.4.3 Coach

Unlike instructor, coach might not have certificate training for tunnel. However some of the coaches might have had instructor training at some point, especially with freefly -coaches.

Most popular coaches has years of experience with flying, but important thing to remember is that even experienced flyers might not be good coaches. Usually coaching skills develop over time, so you should check the coaches experience before booking time so you will know what you are paying for.

44.4.4 While in the tunnel

Before you enter the tunnel, check that you don't have anything extra in your pockets and remove jewelry and anything that can detach and fly in to the tunnel. Perform a gear check so everything is worn correctly and nothing is broken. Anything that can detach (visor, shoe, glove, part of a weight belt) can harm the tunnel and cause a hazard. To antechamber you can bring your own bottle but keep it far away from the tunnel entry. Make sure you have removed your audible altimeter from your helmet. Inside the tunnel the noise is dangerously loud, so always wear earplugs.

Wait your own turn in the antechamber, allow previous flyer(s) exit the tunnel completely and wait for permission from the instructor or coach to enter the tunnel.

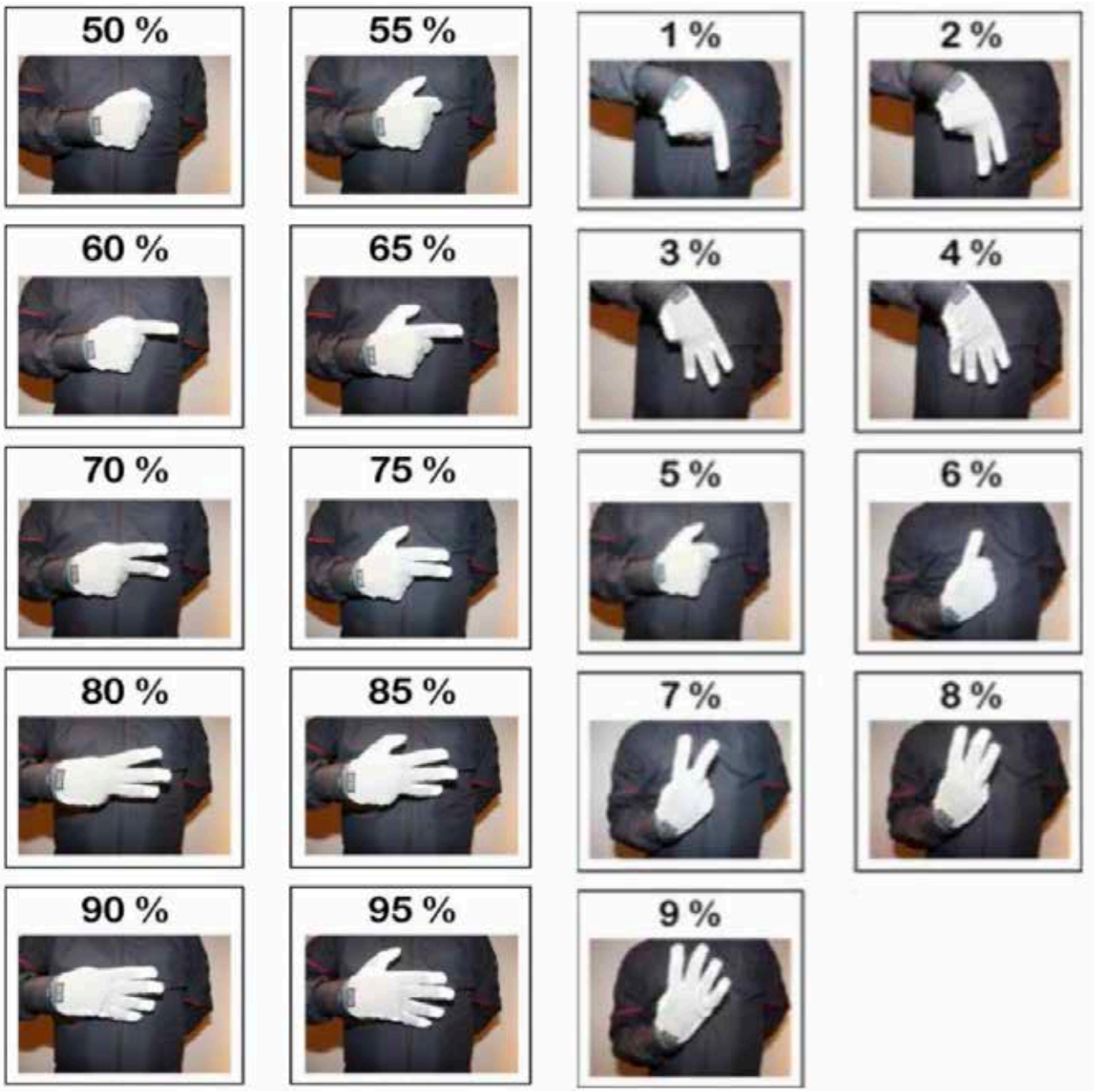
Tunnel lights starts to flash 10–15 seconds before your turn ends, calmly more towards the door and exit the tunnel. Instructor or coach will assist if you have problems exiting the tunnel.

You can have a break between flights and sit in the antechamber and watch your previous flight from a monitor in the antechamber. This is good time for coach to give you feedback and give briefing for the next flight.

44.4.5 Adjusting the speed

You can adjust the wind speed by communicating with the person who is driving the tunnel with simple hand signals (see picture 44.1). When flying with coach usually the coach adjusts the speed for the student and student does not need to worry about this. At latest when you're starting to practice on your own, you should learn how to adjust the wind speed. Please note there might be differences in hand signals between tunnels.

Speed is usually represented in per cents (%). Naturally there are differences between tunnels and especially between manufacturers. For belly -flying usual speed range is for example between 55-75% depending on the size of the flyer. You can ask from instructors what is a usual belly-flying speed with that specific tunnel and what are the hand signals used there. When you're giving hand signals to driver, show them clearly and maintain eye-contact. Double check the speed from the screen before entering the tunnel.



44.1 Speed is controlled by showing hand signals to the driver. Horizontal fingers shows tens of per cents and right after shown vertical fingers either up or down shows ones, thumb is five.

44.5 Tunnel training: what do you do in the tunnel?

44.5.1 Flying with a coach

When you are flying with a coach, he/she is usually physically with you in the tunnel. Coach will make you do drills and exercises and can help you adjusting your body position and maneuvers. Usually coach does show an example, and then helps you perform the same thing while standing on the net.

44.5.2 Flying by yourself

Even when flying without a coach there is a tunnel instructor present at the tunnel door, you should consult that instructor when you have some concerns regarding safety in the tunnel.

You can start flying by yourself once you can safely work alone on your belly. You should focus on drills that you have already tried with a coach and can perform them safely by yourself. You should never try something for the first time alone in the tunnel, if you are uncertain about something, please ask a coach or instructor to help you.

44.5.3 Training with partner, group, “huckjams”

Once your skills gets higher, it is fun, educational and cost effective to start training in different groups or with a friend that is relatively on the same skill level. This way you get more repetition with the same amount of money, when you use only half of the tunnel. However this requires skills to fly in a way that you can take others into account in the tunnel. It is wise to do drills that you are familiar with and can perform safely to protect yourself and others. You can even take a coach with you even when flying with a friend.

When you are flying with a group you have to be able to fly your own slot without bothering others and you need to be able to maintain your level according to the rest of the group. At first this might seem difficult and at first you should do only more simple drills. You should not fly over or under others, unless flying drills that specifically requires flying over or under others.

Training in a group is educational, but also fun! The same way skydiving is more fun in a group. Huckjams are different from traditional training sessions since their biggest point is to have fun and fly with new people. Just like “fun jumping” in the sky. But still you get repetition on the maneuvers and drills you are doing when practicing normally.

44.6 Freeflying basics

44.6.1 Safety

Freeflying in the tunnel should be started with a coach, and never try alone something you haven’t tried with a coach, that might be dangerous!

In the tunnel it is important to learn the skills in correct order so the flying remains safe. If you lose control you should be able to stop the drill safely and recover to a safe flying position. Coach or instructor can help you to practice new skills safely and if needed, hold on to you while you try new things.

44.6.2 Progression

You should always work yourself up from easier stuff to more difficult things, but you first need to show your coach you can fly safely enough your current exercises. Progression can be done for example through following list or adjusted to you by your coach. Order might vary also depending on if your goals are in vertical flying or dynamic flying.

A. Belly flying.
B. Walking.
C. Back flying.
D. Head up on the net.
E. Transitions over legs.
F. High-speed back flying and head up while flying.
G. Low-speed movement, back carving and layouts (transitions over your head).
H. head down.
I. Transition from HU à HD and HD à HU.
J. More advance, high speed dynamic flying.

44.6.3 Learning objectives

When planning tunnel progression it is important to also know your personal goals for flying. Is your goal to learn to be a good all-around flyer or just a stable head-down flying? Are you interested in competing or are you flying just for fun? Your goals might change down the road, but it is a good thing to talk to your coach about them so the coach can modify your progression to suit your goals.

44.6.4 Frustration, nervousness and mental training

Many people might be either nervous or even scared to fly in the tunnel, just like skydiving. It is essential to talk to the coach about it so the coach can modify the training program and try to help with fear. There should be trust between a coach and a student. Healthy fear is a good thing but if you're too nervous, it might slow your progression. If needed, you should even talk to psychiatrist.

In general training should be fun and positive and you should not compare yourself to others. Each individual learns with a different rate, someone might learn some things faster than others, and struggle with other things. Happy flying and humor helps you on your progression more than frustration and anger.

If some maneuver does not seem to work even after trying it over and over again, try something else on the side. Working on one single maneuver is not recommended if it causes you to struggle on your progression. Flying is flying, and all flying helps you to understand the airflow and aerodynamics, body movement and lift. Usually coaches combines different static and dynamic drills to offer you variety of stimulus for most optimal outcome. Maneuver that seems impossible might feel easier after flying something else for a while.

Correct flying can be mentally trained at home from videos and by coach instructions. Mental training supports your progression in the tunnel.

44.6.5 Common training methods

Hand signals used by a coach and typical training

Since tunnel is loud, coach, student, instructor, driver and other flyers usually communicate with hand signals, body movement and physical example.

Coach usually tells you before entering the tunnel some kind of plan and related hand signals so you know what happens and how to react to feedback. Remember that different coaches uses different communication methods.

Usually the coach shows the maneuver first and gives you a permission to try it by for example showing a thumbs up. Before that the coach and possibly the instructor positions themselves in a way they can spot you if needed. This is one of the reasons why you should not try new maneuvers by yourself.

Mirror image training

One typical form of training is so called mirror image, where the coach is usually in front of you and shows an example, and then you repeat what the coach just did in a mirror image.

Follow the leader

Different combinations and movement around the tunnel is done usually by following the coach. The meaning is to follow the coach (not another flyer) as specifically as possible by trying to mimic all maneuvers done by the coach (leader). At the same time it is good to maintain eye contact as much as possible.

This is very typical way of flying in a tunnel with another flyer. Flyers are leading different lines. Goal is usually (excluding competitions) to fly previously defined and practiced lines and transitions. Eye contact should be kept all times, excluding for example 360 turns where you lose the eye contact for a second.

44.6.6 Free flying body orientations

When talking about freeflying training, there should be difference between vertical and dynamic flying. When talking about vertical flying, it usually means flying high-speed head-up or head-down and try to take grips with another flyers.

On the other hand dynamic flying means seamless and smooth movement in the tunnel between different positions in any speed by using for example follow the leader -method.

Next we go through different freeflying related positions that are used as a base in both vertical and dynamic flying. So these are not completely separate and in real life they mix while practicing.

Belly flying

Just like any flying, freeflying starts from the belly. Typical belly flying from a freeflyer is little bit different from the belly position used by a FS flyers (box). Arms are used to steer and controlling the lift more along the body. Stable and relaxed flying position gives a good foundation for movement and pelvis- and leg exercises for different transitions (moving between positions). Also belly carving (moving around the tunnel center head pointed to the middle) and more advanced version head-down outface carving requires good basics in belly flying. Belly flying helps you with skydiving, especially while angle tracking.

Walking

Walking in the tunnel is usually the first maneuver where you start to feel the airflow also on you back. When walking on the net, the airflow comes directly from below. The point is to use the airflow to help you to move different directions. In a basic position your posture is good and let your arms raise above your head. You should stand straight, this way the airflow feels equally in front of you and behind you. When you want to move forward, you open your chest and press your back, head and arms slightly backwards, then the airflow starts to push you forwards and kind of forces you to take steps. Moving backwards works the opposite way, pressing your chest and arms forwards and bending your pelvis slightly, then the airflow starts to push you backwards.

Back flying

Good back flying skills in a different speeds are the foundation of freeflying. Basic back flying training is done a lot in your early career, since it is important not only for foundation for freeflying but also for safety.

Good back flying skills brings a good foundation for vertical flying (head-up and head-down) and also for dynamic flying. For example different transitions, layouts and inface hd carving (back carving) are all developed from back flying and movement.

For example head-up and head-down requires higher wind speeds in the tunnel, when you lose control it is important to be able to “bail out”, in other words to cancel your flying and quickly go to high speed and stable back flying position.

Basic body position in back flying uses your back and legs to create lift while your pelvis stays down. Movement is done mainly by using your legs. Arms are relaxed and stabilizes you and assists your back and legs to generate lift and move around the tunnel.

Transitions

By transition we usually mean movement over your legs from one body position to another. They might be basics for dynamic flying from back flying to belly and other way around (see picture 44.2) or vertical flying basic transitions from back flying to head-up and from there to head-down and back (see picture 44.3).

Natural movement between these body positions requires good cooperation between your pelvis, legs and upper body. This brings a lot of opportunities to combine different techniques and flying lines and it makes more versatile practicing possible, even together with your friends!

44.2. Transition over the legs to basic back flying position and back. Picture by Lauri Aapro.

44.3. Transition from head-up position to head-down position. Picture by Lauri Aapro.

Head-up, “sitfly”

Vertical head-up flying is basically the same body position than in the back flying, but you have your head up and use your arms to stabilize differently. The goal is to get lift under the upper back and under your legs in a way that your arms are free for movement. The goal for good and safe sitfly is good control on your pelvis and overall your control over your body and then natural transition between different versions of head-up.

There isn't one correct way of flying sitfly, even when the practicing starts from a specific basic position. After a while you start to move your legs around to different positions so movement in head-up orientation is effective and taking grips with your hands is easier.

Head-down

Head-down vertical flying means body positions where body forms more or less straight vertical line and pelvis is kept straight above the head. Body position is supported with legs and depending on the speed possibly also with shoulders. Posture is good and as neutral as possible and back and belly does not generate lift.

When talking about head-down flying, it usually means daffy and shelf -positions (see pictures 44.4 and 44.5). These are separated by mainly the leg position. Daffy has one leg bent in front of your body and another bent behind it. In shelf both legs are symmetrically behind your body, or partially slightly in front of it bent in a way that airflow touches the thigh. You can start practicing either one, but your coach might have some reasons to teach one over the other as the first body position.

Just like in head-up, you start to change your body position accordingly later on to make grips or movement easier.

44.4. Daffy pictured from the side and front. Picture by Lauri Aapro.

44.5. Shelf pictured from the side and front. Picture by Lauri Aapro.

Other movement

Flying that uses the entire flying space of the tunnel is often referred as dynamic flying. The idea behind dynamic flying against vertical flying is that movement is constant between different positions and orientations and follow pre-defined flying lines. Dynamic flying uses different transitions, layouts (see 44.6) and carving (see 44.7) around the tunnel and moving higher and lower. You can also learn different tricks, such as flips, spins, breakers and so on!

44.6. Back layout is transition over the head from back to belly.
Transition from belly to back over the head is called a front layout. Picture by Lauri Aapro

44.7. High speed back carving in the tunnel. You compensate forward movement by constantly turning. In the tunnel back carving is started with as low speeds as possible and by practicing correct body position. In the sky this body position is similar to back tracking (angle). In the sky the constant turning obviously does not happen. Picture by Lauri Aapro.

44.7 Freeflying tunnel disciplines and competing

44.7.1 Freeflying

Freeflying as a competitive discipline is starting to become a bit marginal discipline, since VFS and dynamic flying is so popular these days. Freeflying is originally adapted from the sky to the tunnel and is a mixture between vertical- and dynamic flying. Teams of two competes mandatory speed rounds and creates a free routine that is judged by for example technical difficulty, teamwork and artistic point of view.

44.7.2 Vertical flying, Vertical Formation Skydiving, VFS

Vertical flying usually means head-up and head-down flying. Teams of four competes in the sky and in the tunnel. The goal is to complete as many pre-defined formations between HU- and HD-flyers using different grips and transitions. Judging happens from a video and points are calculated.

44.7.3 Dynamic flying

In dynamic flying there are categories for teams of two and four. Flyers are required to complete speed rounds and create a free routine.

In speed rounds teams have to fly through a complicated pre-defined lines and patterns as fast as possible. The time starts when the first person enters the tunnel and stops when the last person is exited the tunnel. On top of the time judges are watching that lines are flown correctly by using lights that are dividing tunnel between sections (sidelines, center line, ring) and mistakes causes extra seconds to the time.

Free routine is judged by giving points based on technical difficulty and artistic point of view and how well maneuvers are executed. There can be music used with the free routine.

44.7.4 Freestyle

Freestyle is a solo discipline and flyer has prepared one free routine and two separate mandatory routines based on current rules for compulsory parts. Points are granted by technical difficulty, versatility and artistic point of view. These days free routines have music almost always.

44.7.5 Competitions for beginners

Most tunnel disciplines has also rookie categories for teams of two. For example Finnish national championships has freeflying rookie category where you can enter when you can fly on your belly and on your back with another flyer.

44.8 Useful links

International Bodyflight Association: https://tunnelflight.com – Events, news, learning material.

Tunnelinstructor.com: www.tunnelinstructor.com/course-material/ – Learning material for tunnel instructors.

Indoor Skydiving World: www.indoorskydiving.world/wind-tunnel-locator/ – Events, news, competitions and info about different tunnels.

Indoor Skydiving Source: www.indoorskydivingsource.com – Tunnels around the world on a map.

FAI, World Air Sports Federation: www.fai.org – Info about all aerial sports and competing.

TUNNELS:

Flyspot: www.flyspot.com – ISG tunnels in Poland. Pictures in this guide is sponsored by Flyspot!

Fööni: fööni.fi – ISG tunnel in Helsinki,

Aeronautica Arena: aeronautical.fi – Formerly known as Sirius Sport resort in Pyhtää. (Aerodium).

PART VI – CANOPY HANDLING GUIDE

45 Canopy handling

Canopies have developed in the past decades really quickly. Quick development in canopies caused in the early 2000s a situation where training and mindsets did not follow the development and there was a clear safety issue at hand. Globally, including Finland reacted to this situation by adding more training and information available for skydivers, and that is how this guide started.

In year 2012 Finland made canopy handling courses compulsory for all B-license skydivers. Course is heavily suggested for all skydivers.

Five decades ago most accidents and fatalities were caused by unreliable gear, including reserve canopies. On top of their unreliable performance their overall performance such as overcoming wind and power during flaring was not at the same level than it is now. During 60s and 70s skydivers used round canopies. More experienced skydivers might have used canopies that had holes in them called performance canopies. While entering 80s more experienced skydivers transferred to use ram-air canopies, but students were still using round canopies.

Late 80s achieved huge leap, when *Parachutes de France* introduced *Blue Track* in 88 and *Performance Designs* brought *Sabre* in 89. These were first zero porosity (ZP) fabric canopies. They flew better and maintained their performance much longer than their predecessors. However they required much more from skydiver to handle and pack them safely. At the same time loading of the wings raised quickly and skydivers were unable to fly their canopies at a level required by the performance of their canopies. Insufficient training and bad attitudes accidents and fatalities grew rapidly during 90s.

Development has had similar direction when manufacturers introduces more aggressive and more performing canopies for more experienced skydivers (*PD Stiletto* 1993, *Icarus Extreme* 1995 and *Extreme VX* 1999, *Precision Aerodynamics Xaos27* 2003, *PD Velocity*, *JVX* and so on), and development does not seem to slow down. At the moment most aggressive canopies fly during landing with similar speeds than airplanes. At the same time for students and more inexperienced skydivers have gotten more highly performing canopies. Unfortunately focus for safe canopy flying is often neglected.

It was noticed during 2000s that most accidents and fatalities around the world happen under a perfectly good canopy. Accidents occur while colliding under a canopy, low turns and high performance landings and so on. This is the reason we have started to understand that skydivers need training for flying the canopy.

In Finland the season is short and annual jump numbers are low compared to bigger skydiving countries. In Finland development quickly went to direction where people were jumping fairly big loadings in relation to their experience level when for example in Sweden and USA skydivers uses much more conservative loadings. Active safety work has worked also in Finland and wing loadings are closer to the international level.

During 2000s in Finland the problem was that there were a lot of accidents during landings for fairly inexperienced skydivers. This is the reason why all skydivers should think on which canopy they want to fly and how much they want to load their wing. This guide is for all licensed skydivers

regardless of their jump count. Each skydiver should familiarize themselves with their canopy and how it works and also principles for flying them safely.

While learning flying your canopy you will notice how great and rewarding it is when landings are getting better under different conditions. Also you start to enjoy the performance and features so much, that you start wanting to fly your canopy more.

This guide is not only truth or simple guide for safe canopy handling. Purpose for this guide is to tell skydivers about aerodynamic laws and their effect on a canopy. Once you understand those, you can start to get to know features of your canopy better and utilize them in practice. You also start to learn how to control your canopy in sudden situations.

This guide is a good start for learning, but a good canopy pilot you will become only after you have the patience to start practice with goals.

46 Features of a canopy

Same size canopies with different design will fly with relative similar speeds even though they would be drastically different in many ways. Try to separate imagination from facts and start comparing canopy statistic objectively. Flying characteristics are also affected by fabric used to make the canopy, number of the tunnels, shape of the canopy, line material, angle of attack and size. When you understand structure and features of your canopy, you can objectively compare canopies and choose best fitting canopy for you. By understanding technical features of your canopy you can also understand why it is performing in a way that it is, and how to make it perform in a way you want to. Remember, that you don't need to load your wing heavily in order to get it fly and land as intended.

46.1 Aspect ratio and number of cells

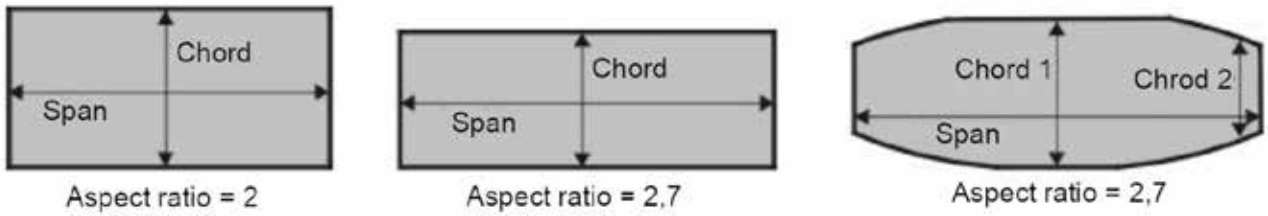
One basic structural thing in canopies is the number of cells. Most student canopies while writing this guide (such as PD Navigator) are 9-cell canopies. Canopies used by licensed skydivers these days are mainly 7- and 9-cell canopies. Number of cells (tunnel pairs) causes certain characteristics and features. In order to understand these, we need to know a certain basic term, aspect ratio. Aspect ratio is ratio between span and chord. Aspect ratio describes the shape of the canopy. The bigger the aspect ratio is, the bigger the relation between span and chord is. With elliptical canopies where chord is not constant, aspect ratio is calculated for relation in span squared divided by surface area.

In the next picture there is different shapes of canopies that are same size of surface area, but aspect ratio is different. One on the left has lower aspect ratio than two others, since span is lower in relation to chord. Aspect ratio effects on aerodynamics in a way that higher aspect ratio canopies offers more lift in relation to resistance.

In theory higher aspect ratio canopy will fly faster with better glide ratio and is more powerful during flare compared to low aspect ratio canopies. This is the first fundamental difference between 9- and 7-cell canopies. 9-cell canopies have much higher aspect ratio than 7-cell

canopies, and their glide ratio is usually better. Higher aspect ratio canopies usually it is harder to maintain good pressure in outer cells and keep the wing in shape. This can be helped by adding the number of tunnels, when structure comes sturdier. In practice current aspect ratios are for 7-cell canopies 2,2:1 and for 9-cell canopies usually between 2,5:1-2,7:1.

So why not build for example 11-cell canopy with really high aspect ratio? Each cell adds walls inside the canopy and needs lines to support the shape. Added lines and seams adds air resistance, makes packing volume higher and adds to costs of manufacture. High aspect ratio canopies responds better to steering and malfunctions and stalling are usually more aggressive. Recovery from malfunction can be un-even. However the biggest reason is, that higher aspect ratio canopies are more often deploying with line twists, since they pressurize un-evenly.



46.1. There are different canopies in aspect ratios. Left one is low aspect ratio canopy, middle one is high aspect ratio non-elliptical canopy and right one is high aspect ratio elliptical canopy. Size is same for all canopies.

Same thing than in recovery, during deployments lower aspect ratio canopies have better pressurization. This is the reason all CRW and reserve canopies are low aspect ratio 7-cell canopies.

So which one is better, 9- or 7-cell canopy? Both have their merits. 9-cell canopy has more lift. Other edge of the sword is higher count of lines and fabric, that adds to resistance and lowers balance. In practice 7-cell canopies have slightly lower glide ratio and they can perform better low speed landings, this is a reason that for example accuracy landing canopies are 7-cell canopies. 7-cell canopy is also more stable in turbulence, since pressure inside tunnels is better.

46.2 Elliptical

In elliptical canopies all tunnels are not same length. So chord is not constant when measuring in different parts of the canopy. Side tunnels are shorter than middle ones and sometimes narrower. When talking about fully elliptic canopies it usually means canopies that both nose and tail is curved.

Nowadays there is a lot of tapered canopies that are designed even for inexperienced skydivers. While writing this guide most canopies are at least semi-elliptical canopies. Even students can jump with tapered canopies.

Maybe the most important basic feature of elliptical canopy is that the span is shorter than chord in the middle part of the canopy. Elliptical canopy pressurizes better and this kind of canopy has

less resistance from air. It produces more lift and flare power. It responds better for steering and loses more altitude while turning.

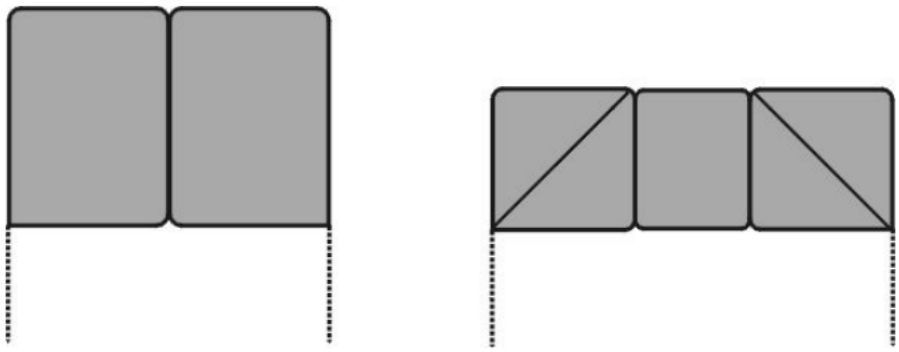
46.3 Wing profile

Profile of the canopy is the side profile of the canopy. It dictates most of the features. Typically 7-cell canopies are higher profile, this means that their cells are bigger and higher than in 9-cell low profile canopies. Higher profile adds resistance (higher profile canopies are slower) but adds more lift with less speed (for example deep brakes). This is the reason for example accuracy canopies have high profile.

46.4 Other structural differences

Modern canopies have also other structural solutions which are introduced in this chapter. Most canopies have cells, that includes a tunnel pair. This means that 9-cell canopy actually has 18 tunnels. Nowadays there is also canopies where each cell is divided in three tunnels for most experienced skydivers for competitive use. This structure is referred as tri-cell structure. This means that for example 7-cell tri-cell canopy is actually 21 tunnels and 9-cell 27 tunnels. Advantages of tri-cell structure is smaller tunnel size and higher amount of parts supporting the canopy. This is a way to make canopy firmer and it can be lower profile. Smaller size and lower profile means less air resistance and makes aerodynamic features better. When canopy is firmer and has better aerodynamics, it can be flown with higher loading that makes pressurizing better. Tri-cell canopies usually use crossbracing to support the canopy.

Crossbracing means support parts added to outermost tunnels in tri-cell structure. With crossbraces canopy structure is even more firm by using less lines (less resistance). Bad side of this is higher production costs since more complex structure and higher packing volume. Crossbraced tri-cell canopies are for example *PD velocity* and *NZA JVX/JFX*.



46.2. Traditional cell and crossbraced tri-cell structure.

46.5 Other factors in aerodynamics

Previous chapter talked about couple of structural differences between canopies and their effect on canopies. In this chapter we discuss other overall technical solutions and their effect on aerodynamics.

Just like we stated in previous chapter, most of resistance on canopy comes from structural solutions. When designing a canopy, resistance can be reduced by for example lower profile. Also other parts in the system have effect on air resistance, such as harness and body position. Almost all current canopies have designs to reduce air resistance, for example collapsible slider and pilot chute. Slider can also be pulled down the risers after deployment, when there is as little as possible fabric in the airflow. Collapsing the slider also helps to save lines.

Pulling slider down the risers raises aerodynamic features also by letting risers to spread more, by doing so the canopy shape is improved and it flies flatter and is generating more lift.

Spreading the risers can be improved by loosening the chest strap after deployment. If loosened too much it creates additional risks, if you for example get a malfunction requiring a cutaway during later parts of the flight.

For competitive use there is also removable deployment systems (RDS), that removes air resistance caused by deployment system (pilot chute, deployment bag and slider) completely. These system are complicated to use and takes time, so they are not as popular yet. Additionally RDS is useful only after you can use 100% of the performance the canopy has to offer.

46.5.1 Lines

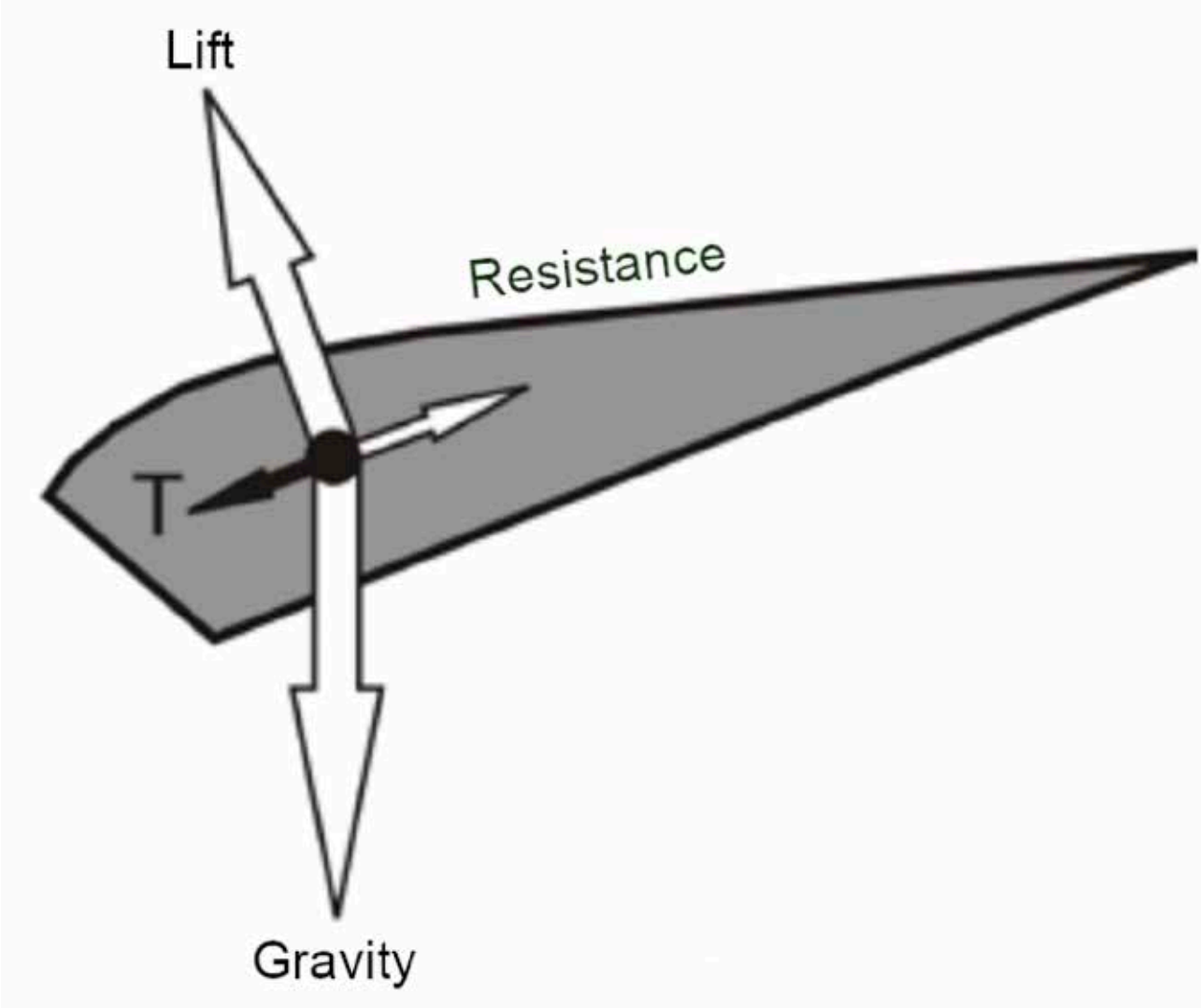
Some of the resistance is generated by lines. We try to reduce the air resistance by developing new, thinner lines from material that have less resistance. Following list has most common currently used lines and their features:

- *Dacron*: Thick material that can withstand usage. Most commonly used in student canopies.
- *Spectra*: (Also known as microline), is relatively thin and can last very long. Bad side is that they shrink during time.
- *Vectran*: Doesn't shrink and is slightly smaller in diameter than spectra. Bad side is that it does not last as long and wear is not as visible.
- *HMA*: Acronym for High Modulus Aramide, just like Vectran, this material does not shrink either. But stretches a little when loaded. This is the reason it is little more forgiving during for example hard deployments. Bad side is that it does not last long.

Lines effect on resistance should not be overlooked. Since old lines are usually the reason for performance issues. Shrinking happens over time and is since being usually unnoticed, since skydivers usually gets used to them. Lines usually shrink more on the sides. Lines should be changed often enough (between 300–400 jumps).

47 Physics effecting on canopy and lift

There are multiple forces acting upon a canopy that determine how it will act. These forces determine direction and speed for travel. Skydiver can effect short term on these forces and their direction, but basic principles of physics skydiver cannot (unfortunately) change.



47.1. Forces on canopy in stable flight.

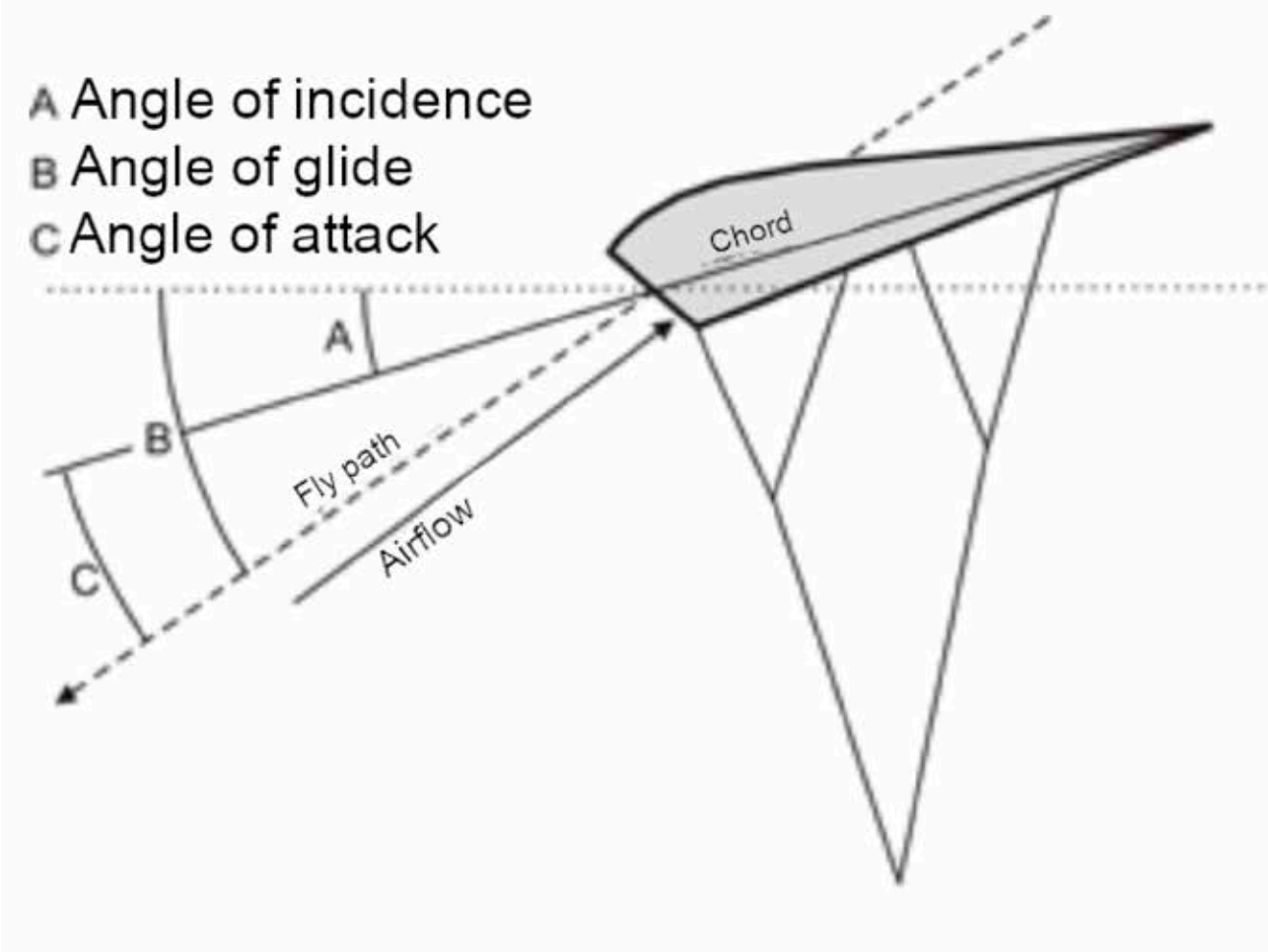
As stated before, force braking the canopy is resistance. Total resistance (drag) is formed by resistance by the system, shape resistance and induced resistance . Resistance can be reduced drastically by different technical solutions, but it cannot completely be removed. In aviation devices force pushing forward is generated usually by engines. Since parachute does not have engines, air speed and lift is formed by glide angle and gravity acting on skydiver and parachute system. This way we get also thrust as a result of forward steering component and downwards pulling gravity. Canopy in stable flight (not accelerating to any direction) the sum of these forces is zero. Lift is generated when canopy flies through the air. Lift can be considered to be present by aerodynamic lift according to Bernoulls law with wing profile causing pressure difference on top of and below the wing because of difference in flow of air (lower pressure on top).

The greater the mass is hanged under the canopy, the greater the air speed. The greater the air speed, the greater the lift generated but also more resistance. Weight under the canopy is represented as wing loading. Wing loading is not a constant, since radical turn or flare momentarily adds weight. Let's think about a ball hanging on a thread: the greater the speed of rotation is, the tension in the thread gets higher to keep the ball on orbit. Same force is acting on a skydiver while turning. Up to a certain limit we can think that greater mass under the canopy makes theoretical performance of the canopy better, since lift is higher. In practice canopy flying

60km/h generates four times more lift, and resistance than canopy flying 30km/h. However all this adding to air speed has a down side too that is discussed later while discussing about flying the canopy and different wing loadings.

47.1 Glide angle and factors affecting it

Canopy lines gets longer by the group (A-, B-, C- and D-lines) towards the tail. This is called a trim, and it makes the canopy fly in desired angle. This angle between horizon and chord is called angle of incidence. Angle of incidence can be changed in flight only by pulling risers. When pulling front risers angle of incidence gets steeper and when pulling on rears it gets flatter. Angle of incidence sets the chord in profile to a certain angle in relation to relative wind, and this angle is called angle of attack.



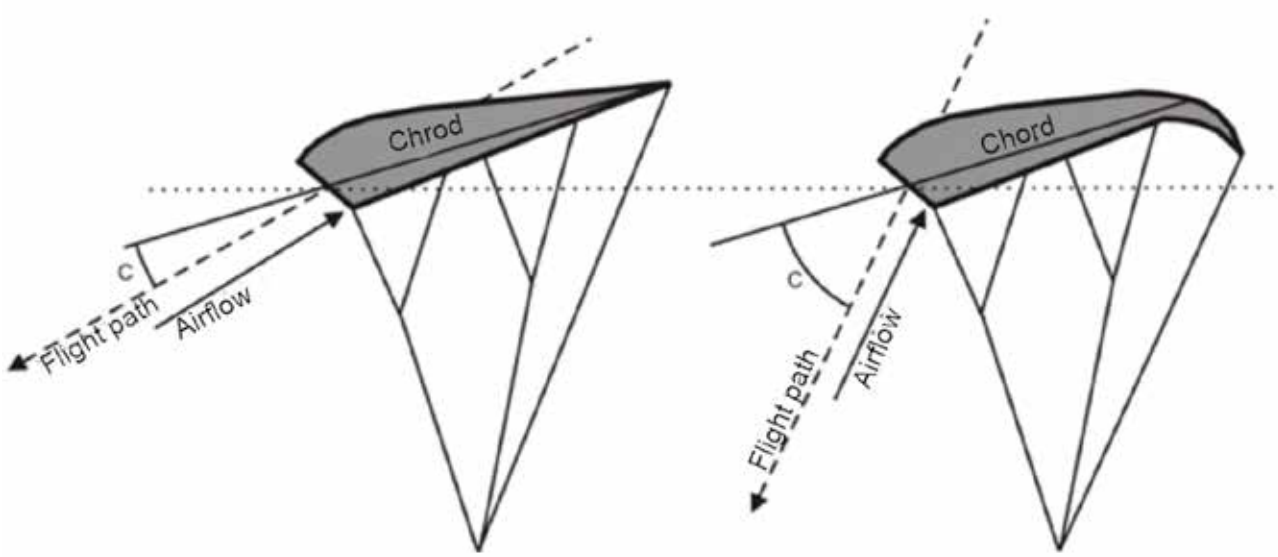
47.2. Angles of a canopy.

Angle of attack is the angle of airflow attacking the chord. Canopy angle of attack can be modified by either braking or changing the location of weight under the canopy.

Angle of attack can be changed also by quick steering maneuvers. Either by using toggles or risers. Quick steering maneuver causes the fly path to change quickly. Skydiver at the end of the lines cannot compensate instantly and causes a pendulum effect. When weight moves forward, angle of attack flattens and canopy flares. When weight moves backwards, angle of attack gets steeper

and canopy attacks forwards and downwards. Same effect happens when using only one side of toggles/raisers, when weight moves also to side on top of forwards/backwards, then canopy starts to turn while attacking or flaring.

Glide angle is angle between fly path and horizon. It determines the glide ratio, meaning how much canopy will fly forwards in relation to altitude lost. Glide ratio changes between different flight statuses between 2:1 and 3:1. More accurate glide angles are not determined by manufacturers since it is really hard to measure and there are too many variables.



45.3. Angle of attack (C) and it changes by using toggles.

47.2 Stall

Stall can occur in canopy (just like in airplanes) in two ways: **Braked stall or dynamic stall.**

Usually braked stall is more common. If the speed of a canopy (or anything else flying) is braked too much, it stops creating lift. Once it doesn't generate lift it stops flying forwards. Airflow is not coming from up front and pressurize the fabric canopy, instead it is coming from below. Angle of attack is wrong. On top of losing lift, fabric canopy loses pressure and collapses. Canopy and skydiver starts to sink downwards with accelerating speed.

However canopy is possible to stall also in high speed. If angle of attack is changed too quickly, flight path does not have time to change even though flight path to relative wind has changed drastically. Canopy and skydiver still has speed towards the original flight direction, but airflow caused by the movement is acting on the canopy from wrong direction. Once again we lose ability for lift and airflow keeping the pressure in the canopy. Compared to braked stall lift is lost more quickly and collapsing the canopy can happen as quickly.

Stall speed is made greater by for example high performance canopies and adding wing loading and especially for dynamic stall the G-forces (for example during high performance landings) and air temperature that changes air pressure, humidity and altitude.

Dynamic stall is dangerous especially during high performance landings close to the ground when G-forces are making stall speeds higher. If you need to bail out from the dive, never use rear risers to do so, use only toggles. While using toggles the canopy most likely have time to react and swing skydiver forwards while angle of attack changes.

48 Wing loading and canopy categories

Wing loading determines how much load is under the wing in relation to the surface area. Wing loading is usually represented by pounds (1lbs = 0,454kg) per square feet (1sqft = 0,093sqm). You get your wing load by taking your exit weight in kg, multiply it by 2,2 to get pounds and divide that number by the size of your canopy (in sqft).

> *For example:*
> *85kg exit weight and 150sqft canopy:*
> *85x2,2 = 187*
> *187 / 150 = 1,25 lbs/sqft.*
> *Wing load: 1,25.*

Remember that the wing loading is not accurate way to compare two different canopies and their performance. Different types of canopies and different wing loadings can achieve different results. Canopies are designed to work in certain wing loading area and overloading or underloading will lower the performance. Some canopies has really wide spectrum for loading and others will work only with small differences.

Aerodynamic efficiency will get lower on same type of parachute with similar wing loading when wing size reduces (for example seams take bigger part of the surface area relatively). At the same time canopy is more sensitive and aggressive since lines are shorter. This is the reason lighter skydiver should fly with smaller loading to get better performance and control. For example skydivers with similar background but different weights might end up choosing different loading to get similar characteristics from their canopies.

Following list has performance windows for canopies. Optimal area is in the middle of the spectrum. This list is only brief. You also need to remember that if you want to change canopies you should be able to fly your previous canopy and wing loading before changing.

- Student canopies (*Navigator, Commodore*) 0,5–1,2
- Accuracy canopies (*Parafoil, Zero*) 0,6–0,9
- All-around canopies (*Sabre2, Pilot, Safire, Magellan*) 0,9–1,7
- 7-cell all-around canopies (*Spectre, Storm, Skipper*) 0,9–1,6
- Elliptical canopies (*Crossfire, Katana, Odyssey*) 1,5–1,9
- Crossbraced canopies (*JFX, JVXm Velocity*) 1,7–2,5

Next there are six categories for canopies and wing loadings that describes further differences in performance and flight characteristics in different structural and wing loading categories. Think while choosing canopy which category you want to choose and why.

Class 1, student canopies and accuracy canopies 0,5–0,7lbs/sqft

Typical canopies are student canopies, accuracy canopies and other 7- and 9-cell high profile f-111 fabric canopies in sizes over 200sqft. These wing loadings are used mainly with student canopies. But also if you are older or uncertain of your abilities, you can choose class 1. Canopy turns slowly and loses little altitude while turning. Approaches and landings can be accurate even during braking flight status. With such loading it is not suggested to jump over 8m/s winds, since turbulence can be dangerous and air speed is not sufficient to overcome the wind.

Class 2, calm 0,8–1,0lbs/sqft

Typical canopies are same than in class 1 with heavier loading, or other 7- or 9-cell canopies manufactured with ZP fabric with light loading. We are still talking about fairly calm canopy. This is a suitable class for advanced students or licensed skydivers who want to play safe and also for example show jumps where landing areas are not ideal. Higher winds and turbulence is still effecting drastically to these canopies. Canopy is calm to steer and landings are safe even for inexperienced skydivers. However low turns should be avoided, since speed and rate or descent gets higher during turns clearly more than in class 1.

Class 3, mid-field 1,1–1,3lbs/sqft

Typical canopies are ZP 7- or 9-cell all-around canopies loaded to their optimal area. This class can be used as a base for comparison. There is enough loading to have fun, but more inexperienced skydiver can still control the canopy safely as their first canopy when they have a good mental setting for flying it. However it has enough performance that you don’t have to change canopy right away at least for another 100-200 jumps, if even then. However this class requires a bit more from a flyer, so beware. Most of the used canopies getting sold is in this class. Winds are not a problem anymore, as long as limits are respected (11m/s). Finnish Aeronautical Association has set a limit for A- and B-licensed skydivers to be 1,34lbs/sqft while keeping in mind the chart for suggested wing loadings provided by parachuting committee.

Class 4, fast canopies 1,4–1,8lbs/sqft

Typical canopies are ZP 9-cell canopies with either semi- or fully-elliptical wing with their optimal loading. This class is already very highly performing canopies and at the same time we move to clearly dangerous loading category. Speeds for turning and loss of altitude are clearly higher than class 3 canopies. Canopy needs to be flown throughout the whole landing. Necessary steering movement is clearly smaller and stalling might be really aggressive and sudden. While flying in this class it requires much more experience and skill from the pilot. This class requires much more currency and jump numbers (over 100 jumps per year) to be safe. Touch to the flying needs to be good, since things are happening much more quickly. In windy conditions effects of turbulence is much smaller but if something happens, malfunctions are more brutal. This applies to everything else, if you collide with anything, you have more speed. In this class even landing surfaces matter, since you are unable to kill the speed during landing completely.

Class 5, very fast canopies 1,8–2,0lbs/sqft

Typical canopies are new more performing 9-cell elliptical canopies where there is applied air lock technology or partially closed nose or crossbraces. If you want to fly a canopy in this class, think hard on what you are doing. Canopy flies really fast and reacts really quickly to inputs and shifting of weight in the harness. Stalling is sudden and aggressive. At the same time there has been compromises in slow flying and deployment abilities. There is not much room for errors, if error occurs, it usually ends in injury, since canopy is flying with such high speed. Many who are flying in this class does not use the whole potential of their canopy. Almost same performance can be achieved in class 4 canopies by using all potential performance of the canopy, class 4 would offer more room for errors. Do not move from class 4 to 5 without hundreds of jumps in previous class.

Class 5, competitive canopies over 2,0lbs/sqft

Typical canopies are crossbraced and other really low profile canopies with heavy loading. For all-around canopy do not choose this class. Usually speed is acquired by compromising in other important aspects, such as deployments, stalling performance, slow flight. If however you mainly do fast landings, jump much, are ready to focus on your landings and you have sufficient experience from previous classes, these canopies might be worth it. There are absolutely no room for error and landing in smaller area is usually really hard. Even competitive skydivers uses two different canopies during competitions, one for accuracy and distance, and one for speed. This is caused by the fact that while flying in similar loading, bigger surface area offers more control and flare power on lower speeds.

49 Choosing canopy

While choosing a canopy, compare canopies that you know and think what features you want from your canopy. Do you want to go fast or slow? Slow one offers more room for errors. Or do you want to get smooth deployment and guarantee of a safe landing in a tight spot?

Wing loading charts provided by manufacturers should not be the only way to compare canopies, since also you own skill and experience level is a factor. You should try and jump test jumps with variety of canopies and discuss with for example safety officer, chief instructor, canopy coach or instructors before making decisions. You should ask feedback from more experienced jumpers about your landings. Remember that everyone has their perspective from their own skill level. One canopy might be slow for one person and same canopy for someone else might be fast and aggressive.

If you choose to downsize, think about why. Do you want more speed, longer flares or higher turning speeds? Or do you want to get more features? Different canopy types have different features, so size and load are not the only factors. Also remember downsides of downsize, greater stall speed, less room for errors, greater speed even during accidents, off-landings and your own discipline and combability issues.

Take following points in to account when choosing new wing:

- Should I take more out from my current wing by practicing more?
- Should I change to different type of wing with same size?
- Are you after speed by raising your loading?

With too small high performance canopy should not be used to compensate errors in your technique. Especially with your first canopy you should jump hundreds of jumps where you learn to control your canopy in different situations and places. Once you receive your C-license and technically can fly with any canopy there is does not mean you have to get smaller canopy. Only after you have learned to use your current canopy you should start thinking about getting smaller one. This way learning the next canopy gets easier, when you have previously learned skills already in your bank.

49.1 Limitations set by your discipline

Different disciplines require different features from your canopy, even though technically all-around canopy can be used for everything in theory. It is really important that you know the features and limitations of your canopy. Following list for example:

Camera work

It is important to have as smooth as possible deployments when doing camera work. When jumping with a camera helmet it is important to choose conservative canopy so that possible malfunctions are not as aggressive and you have more time to act with your helmet.

Wingsuit

Most common malfunction is twists in lines. This is the reason canopy should be as calm as possible and loaded conservatively, so the twists do not end up in orbiting malfunction and using reserve canopy. During deployment it might not be possible to prevent twists, since wings are limiting your movement. Also opening your wings after deployment needs movement around, so shifting your weight in your harness shouldn't start steering the canopy. Nowadays there are also problems caused by modern high performance wingsuits combined with small canopies. Bigger surface area of the wingsuit causes bigger burble behind the flyer, this combined with small canopy with short lines causes situation where canopy is sucked in to the burble during deployment. Finnish Aeronautical Association suggests canopies to be used that are suitable for A- and B-license skydivers.

Show jumps

You should always choose a familiar gear for show jumps. Rather too big than small. During show jumps landing areas are usually small and skydiver must be able to perform short approach and flare. You should be prepared to land also somewhere else than planned landing area.

Competitive jumps

All kinds of competitive jumps usually have limited landing area. Choose canopy that if necessary, you can hold for longer while others land. During competitions you should use familiar gear, so it leaves more mental capacity to competition itself.

Freeflying

During deployment there might be more speed compared to other disciplines. So avoid rapidly deploying canopies.

Bigway

There is a lot of people in the sky during deployment. So do not choose canopy that is known to cause off-heading deployments or linetwists. Avoid also specially fast canopies, since there is a lot of canopies at the sky.

FS

Remember possible added weight during FS jumps. This is effecting especially small skydivers that usually wears additional weight to compensate on their speed and elevated loading has more effect since their lines are shorter. Discuss with more experienced FS jumpers before choosing the canopy.

Canopy piloting

Is a discipline that uses high performance crossbraced canopies. Remember your own skill level if you start swooping. Smaller loadings and all-around canopies can be used to practice swooping, it is even a lot safer. Practice technique first with bigger canopy before moving to smaller ones.

Canopy formation

Canopies used are usually much different than all-around canopies. They have thicker lines, bigger toggles and possible additional devices to change angle of attack. Also deployment system is different and pilot chute bridle is inside the canopy after deployment. Landings might be difficult with these canopies. Deployments are rapid and aggressive and these canopies are not designed to deploy from terminal velocity.

Accuracy

Typical accuracy canopies are made from F-111 fabric, they are big 7-cell canopies with high profile that can be flown really slow and if necessary, landed vertically straight down.

50 Atmospheric effects on canopy performance

In order to skydiver to understand how canopy works in different conditions it is important to get to know the material in where the canopy flies, air. Since air might change according to conditions, also canopy performance will change. These changes can be roughly divided in to two categories, weather and physical features.

50.1 Weather

Wind effects on flying the canopy and exit spot determination are discussed more in detail later. Most notable physical phenomenon in atmosphere effecting canopy flying is turbulence.

Turbulence is formed by following ways:

1. Airflow is interrupted by mechanical obstacle (such as other canopy, building, hill or forest edge) and turbulence is formed. Turbulence that is caused by hills and buildings during strong winds can reach up to hundreds of meters. Good rule of thumb is that turbulence can reach at least 10-20 times the height of the obstacle from it. Stronger winds means that it reaches further.
2. When canopy is flying through air there is turbulence behind the canopy, these can reach tens of meters behind the canopy. It is wise sometime to fly planned flight with higher altitude close to another canopy and see how much turbulence affects. Do not land close behind another canopy, and if you are doing high performance landing, mind others and do not gather speed right in front of other canopies.
3. Close to air masses with different features (thermals) or flows (stratum winds) and their edges causes turbulence. Warm air tries to raise higher and cooler air is flowing to its place. Locally directions of flows might change greatly, especially near the edges of different temperature areas. Especially during the spring differences of surfaces and air might vary greatly. Runways, forest and snow are warming with great differences. Also difference between water and beach temperature is big and winds very uneven. Close to a thunder clouds winds can be really strong and there is a lot of turbulence. Never jump to a thunder clouds or when one is close by. Remember that there is low pressure area below a thunder cloud that “sucks air”. This is a reason why thunder clouds seem to move in to the wind and this way skydivers make mistakes, since it looks like the wind is coming from opposite direction.

Size of a turbulence might vary from centimeters to tens of meters and strength from unnoticeable to canopy collapsing. Turbulence can affect in a way that flying feels bumpy. Side tunnels might collapse or even in extreme situations whole canopy might collapse. Canopy collapses when air is coming from such direction, that airflow is not able to make it in to the canopy. Canopy starts flying again only when airflow direction is correct. With modern canopies you should always fly with full flight status through turbulence so that the tunnels have maximum pressure. Avoid quick and radical steering. Do not pull on front risers while in turbulence, even if speed gained from doing so pressurizes the canopy, since turbulence might cause the air to come from a wrong direction and canopy can collapse in low altitude.

50.2 Air pressure

At sea level air pressure is usually around 1013 mbar. While going higher, air pressure drops in a way that at 600m it is around 93%, 4000m around 60% and 6000m around half of original. During radical weather pressure can be at sea level around 950mbar and highest 1040mbar, which is around 450m difference in altitude. This can be observed at the ground also in (mechanical) altimeter in difference between days. The higher the pressure is, it is more tense and carries more.

50.3 Air density

Air density or density altitude is the most useful tool to think about different conditions and their effects on canopy performance. Density altitude is compared to standard conditions, where air does not have moist, pressure is 1013mbar, temperature +15 degrees Celsius and density is 1,225kg/m3. Air density gets lower when altitude gets higher in a way, that in 600m it is around 94%, 4000m 66% and 6000m 58% compared to the density on the sea level. The smaller the density is, the lower the carry.

50.4 Air temperature

When warming air expands freely, density lowers at the same rate. Cold air is more dense than warm and offers more support. When air temperature raises air tries to move upwards and that causes thermals and turbulence.

50.5 Humidity

Since vapor is lighter than dry air, air density gets lower when humidity raises. Dry air is more dense than humid and carries better. So it is important to remember, that when jumping in humid conditions, canopy will not fly as far and does not flare as well.

50.6 Density altitude effects on canopy performance

The lower the density altitude the better the canopy will perform, flare and recover from a dive. Density altitude changes according to already previously described things and has an effect of canopy performance. Density altitude effect can be described by following example. Let's compare two different days at same landing area:

1. Hot (+35 degrees Celsius), humid (almost 100% relative humidity) summer day and low (980mbar) air pressure. We can count density to be at 1,11kg/m3. This is similar density than 1050m altitude.
2. Chilly (+2 degrees Celsius), dry (humidity 25%) spring day and high (1040mbar) air pressure. Since these factors density is 1,31kg/m3 and is similar than -700m altitude.

Difference of two days in extreme cases can be as much as 2000m difference in landing area elevation. This can be compared to a difference in landing with a 120 and 135 sqft canopies. If your intention is to perform high performance landing, can starting point for a dive be tens of meters higher and flaring altitude also much higher. Neglecting these points can cause a serious

danger or even accident. Especially when going to another dropzone that has different elevation and different weather compared to familiar one these should be taken in to account.

51 Landing techniques

Main function of a canopy is to bring skydiver safely down. No matter the technique you choose, primary goals for when vertical and horizontal speed stops are:

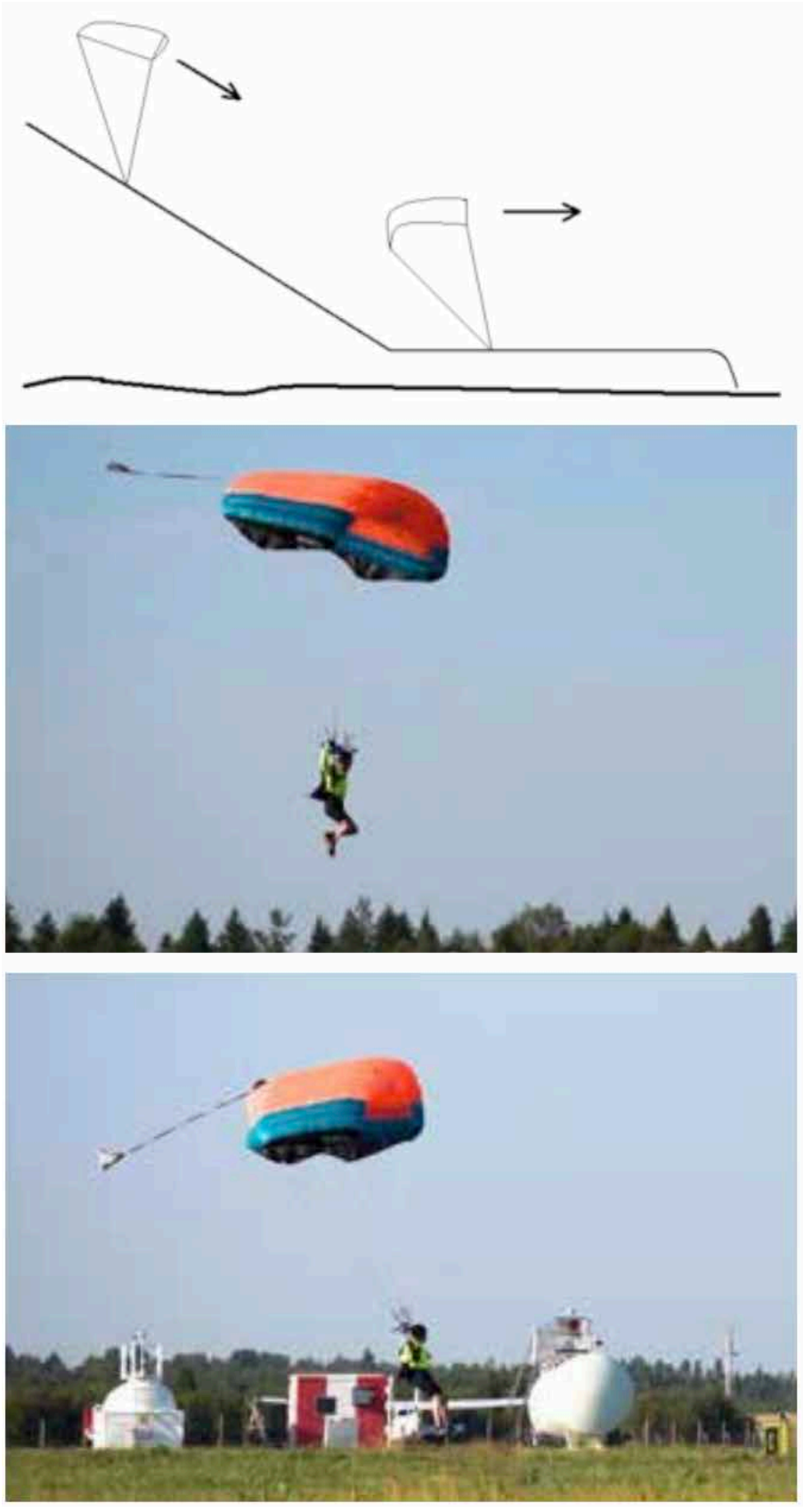
- **Speed should stop at safe altitude from the ground** (not inside the ground or 10m above it).
- **Canopy should be level over your head** (canopy is not turning or diving or stalling).
- **Landing occurs towards head-wind** (however rather towards down- or crosswind than breaking first two points).

51.1 Correct flare

Purpose of a flare is to change direction of a downwards speed to forward speed. Correct flare is started by sharp start by pulling toggles quickly around shoulder level. Required sharpness and amount is dependent on canopy features. By doing this, weight of the skydiver is shifted forwards below the canopy, then direction shifts and canopy starts to fly horizontally. Altitude depletes by calmly pulling more, when also the speed reduces.

During a proper flare toggles are in about half braked position while flying horizontally and this way skydiver has some steering wiggle room in them. Canopy should be actively flown until airspeed is completely gone. Steer canopy with small and steady movements. This way canopy flies better and it is easier to stabilize it during turbulence. Also it is easier for others to predict your actions.

When loading gets lower, headwind higher and higher air speed all reduces the required amount and sharpness for the initial flare in a way that flare can be slow and calm. During high performance landings flare can be calmer, since there is more energy for flare since there is more air speed.



51.1. Shift in direction of flight during proper flare.

51.2 Straight final approach (no high performance)

Straight final approach is the normal way of landing. In this technique there is such a long time from last turn before starting the flare that there is no extra speed caused by that turn. Usually final approach takes around 8-10 seconds. All modern canopies can be landed by this technique. If you have a feeling you need to gather speed for landing, your technique is wrong. If you have problems during most of your normal landings, it is not a right time to start practicing high performance landings.

Even if you handle this basic technique and have no desire to start practicing high performance landings it is good to experience slightly added speed to your landing. This way you are better prepared if your landing speed is slightly higher for some reason. This might come handy if for example your landing is tail winded or you have to dodge some other skydiver landing close by. It is also good idea to practice slight turning while flaring so you know how to avoid collisions if necessary. For this you might need some additional speed for landing.

51.3 Braked approach

There are situations where you need to perform flare from partially braked position. If for example you have to use reserve landing area with wither main- or reserve canopy there is always possibility that the landing area in use is much smaller than you are used to. When landing area is small, it is suggested to fly the whole pattern in half braked position to get additional time and spectrum to work with. In this case it might be necessary to also flare from half braked position. When flaring from half braked position you have much less energy available to convert to forward motion. In other hand if you flare from half brakes you can minimize forward facing motion if landing area is short. Flare needs to be lower and much more aggressive. In this case there is no two stages of flare, you should just pull everything at once. If you have to land to small area and use a lot of brakes for approach, prepare to PLF, it usually prevents injuries.

Remember that while landing to a small open area with high obstacles on the sides (forest for example) you might encounter severe turbulence while landing and your canopy is at risk to collapse since it doesn't have the speed to overcome the turbulence. If you get sensation that your canopy is not stable, lift your toggles little bit higher so the pressure inside the canopy improves and prevents collapsing. Below this turbulence caused by obstacles might be much lower winds, and that means that the speed gets once again higher. Even though braked approaches are not necessary often, they should be practiced regardless. It is good to know what to do before you don't have a choice.

51.4 Braked turn

If you need to utilize braked turns for landing, usually you (or someone else) has made multiple mistakes up until that point. Airspace-, altitude- or location awareness and landing pattern planning should be improved if this is the case. You also might have to dodge someone else who has done these mistakes. Purpose of braked turn is to turn 45-90 degrees in lower altitude. Turning might need to end straight to flaring status. In this case braking is started with only one toggle, soon after you start to kill the speed by adding opposite toggle; not too much, so the turn

continues towards desired direction. When turn is complete both toggles are at flaring position and canopy flares speed away close to the ground.

This technique requires a lot of practice but can be used to avoid dangerous situations. For example canopy collision or colliding with an object are good examples on situations you might need to utilize braked turns. Start practices with higher altitude and observe how much altitude you lose during 45 or 90 degree turns. This way you know how low you can perform braked turns if necessary to avoid serious injury. Braked turn can also be performed by at first pulling both toggles to half braked status, then adding another one to start turning and following with the opposite one to stop the turn. This way suits better if there is bit more altitude or time and might suit better if need for a turn is higher than 90 degrees. Always remember to check airspace before practicing, since there might be another canopy behind you.

51.5 Crosswind- and tailwind landings

Some situations bight require landing away from the ideal direction. Situation might be known in advance if landing area and situation requires, but also it might become as a surprise if you don't have time or altitude to turn towards headwind. This is the reason it might be good idea to practice these in advance.

Practicing also removes the need to always land to headwind that might be in a quick situation or low altitude even dangerous. Landing to tailwind always results less injuries than hitting ground hard after a low turn.

Crosswind- and tailwind landings are also good way to practice before getting a smaller canopy. At first practice both when it is not too windy, you should never hurt yourself on purpose.

Remember that you cannot brake your canopy that much that you would start flying backwards. This means that at the end of the flare you should have at least same speed in relation to the ground than wind speed currently is. And even after a perfect flare it might mean that there is too much horizontal speed to burn by running, so always prepare to PLF. Don't reach with your hands, since one of the most common injuries are wrist injuries.

During crosswind- and tailwind landings the most important thing is to time flare correctly. Flare needs to be started at correct altitude, around 1–1,5 meters higher than normally. You also need to flare all the way down while you are still flying horizontally. If you are still 1,5 meters in the air while the canopy stops flying, your landing will be hard.

So remember, that before you start practicing this, your normal landing technique needs to be strong. This means that your flare is symmetrical and is performed all the way down at correct altitude (meaning that when your legs hit the ground and not 1,5 meters up in to the air).

While landing with a strong crosswind normal flaring technique (symmetrical) causes the canopy to start turning towards the tailwind. In this situation skydiver often tries to reach with their leading leg, that just enforces the turn even further (reaching problems, balance problems, look chapters 52.10 and 52.11).

During crosswind landing you need to turn the canopy slightly in to the wind while flaring. This way skydiver travels straight in relation to the ground. Turning is done by pulling that side toggle slightly more which is facing the wind. By how much is depending on the canopy used, wind speed and so on. Only at the very end you make sure that both toggles are at the same level if necessary. For this reason it is a good idea to practice slight turning while flaring before starting actual crosswind landing practices.

51.6 Flaring by using rear risers

Flare, or part of it can be done by using rear risers. If steering line snaps or gets stuck or toggle is lost at an altitude where there is no safe way to cutaway, flare can be done by pulling rear risers. When flaring with rear risers the first part is done calmly. Rear risers can also be spread or pressed backwards. Flaring and steering from rears should be practiced with higher altitude by learning how the canopy reacts on riser inputs in comparison with the toggles. By using rear risers the canopy might stall more suddenly. It is important to learn in higher altitude that how much you can pull risers without stalling the canopy. Always prepare to PLF when landing by using rear risers.

With faster and competitive canopies flare can be started by pulling rear risers and continued with toggles. This technique prevents speed loss during early phase of flare. End of the flare is still done by using toggles. This technique is complicated and for that reason practiced a lot (tens of times) with higher altitude before applying it to an actual landing, since canopy will stall more easily with rear risers than on toggles. With these speeds turning accidentally during unsymmetrical flare can be fatal.

If high performance landings is your goal, this technique should be practiced already before moving towards higher performance canopies.

52 Landing problems

Landing is a part of a skydive where there is most injuries. In this chapter there is examples on common mistakes. One mistake might not cause injury, but combinations of mistakes might build up and cause an injury. When adding more load and flying higher performance canopies these mistakes are more crucial. If you are thinking about changing your canopy to a more performing one, first remove mistakes from your landings and practice different landing techniques.

52.1 Not enough speed

Flare has more power if you have more speed. Killing the speed during final approach with unnecessary braking or too many steering motions during final reduces the flare power. Some skydivers to a swinging turn right after their last turn to final approach with high altitude where the canopy starts to flare in result and only after that starts to build up more speed. If flare has to be done at the point where canopy is only building up speed, it will be relatively powerless. Keep full flight status on your canopy during whole final approach and avoid unnecessary steering and braking.

52.2 Pumping

When ram-air parachutes came to markets skydivers were taught to pump the speed away by pumping the toggles. Unnecessary pumping however just takes the speed away and power from the flare. Keep full flight status throughout the final approach. Even airplanes don't pump their wings for landing.

52.3 Sloppy flare

Most common landing mistake is a sloppy flare. When flare is started too high and performed too calmly, canopy does not change pitch and canopy does not start to fly horizontally it results in to a hard landing.

52.4 Too short flare, or no flare at all

If flare is too short or is not done at all the canopy will not start flying horizontally and that causes a hard landing. Forgetting to flare might be a result of focusing on something else during the final approach. Remember that you have to pull toggles all the way down while landing to kill as much speed as possible.

52.5 Uneven flare

Uneven flare turns the direction of your canopy. This is usually followed by reaching to the ground. Usually right handed person pulls right toggle too much and left handed left.

52.1. Uneven flare, right hand lower, canopy is falling to right.

52.6 Flare too early or too late

If flaring is done sharply too high, we end up “on a shelf”. It is not necessarily a big problem, if you don’t do other mistakes at the same time. Do not lift your toggles, instead brake all the way before touching the ground. Most common other mistakes are balance problems and reaching, when one hand or leg reaches to meet the ground before landing. In this case the position of the harness and canopy flight status changes and canopy turns. Pressing toggles too low too quickly can stall the canopy. Then you might drop on the ground back first. If you do flare too early, keep your hands where they are and prepare to PLF.

Flaring too late does not have time for the canopy to start flying horizontally and it results to hard landing.

52.2. Flare too high and hands not level.

52.3. Flare too late, luckily there was water to soften the blow.

52.4. Steering lines are too short and canopy stalls backwards while skydiver is still moving forwards.

52.7 Too powerful flare

Too powerful flare means that the first part of the flare is pulled too deep. This might result the canopy to start flying slightly upwards during the early stage of the flare. If you notice the canopy to start flying upwards, don't add brakes and keep the toggles at the same level. When canopy starts dropping again, do a sharp pull before the ground. This is similar situation than performing flare from half braked position.

Too short steering lines might cause too powerful flare. In this case canopy might stall at the end of the flare. While hands are pointing downwards and skydivers movement changes forwards it is natural reaction to start reaching with hands. This might result in to a wrist- or head injury.

If you notice your canopy stalls at the end of your flare, ask assistance from a rigger, since most likely you need to extend your steering lines.

52.8 No steering all the way

Canopy must be steered as long as it flies. When canopy is in level flight (horizontally) it still has a lot of air speed. Remember to kill the speed completely before touching down. Stop steering only when movement is completely stopped.

52.9 Hands up after touchdown

People have many natural reactions that happens quickly and unnoticed before watching them in a video. Some skydivers tend to raise their hands quickly right after the touchdown. This is followed by canopy attacking forwards and skydiver falls down. Focus on steering without lifting your arms.

52.5. Reaching. Skydiver reaches ground with their hands or their legs, canopy falls down towards the reach.

52.10 Reaching

Skydiver naturally protects themselves by reaching. When toggles are in hand and balance shifts, movement is directly affecting the canopy and canopy starts to turn. When reaching with their legs, the balance within the harness changes and it results to turning as well. Reaching is a natural reaction for protection.

52.11 Balance problems

When balance is shifting constantly while landing it feels like walking on a thin line. Skydiver compensates sideways movement by lifting opposite arm up, then canopy is turning even harder and causes hard landings!

52.6. Balance problems. Skydiver has lifted left hand and at the same time started reaching with right leg. Canopy turns to right.

52.12 Moving arms while running

After flaring during horizontal flight if there is still speed left and it needs to be killed by running it should be ran in a way that arms stay as stationary as possible. Arm movement effects directly on the canopy and it might result for the canopy to fall to the side.

52.7. Arms are not on the same level while running and canopy falls to the left.

52.13 Raised legs during flare

On reflex is to lift legs when arms are pulling down. It results to landing on bottom. Focus on steering without lifting your legs. Hard landing on bottom might cause damage to spine.

52.8 Skydiver flares and lifts his legs at the same time.

53 Dive flow during canopy handling jumps

Canopy flight is a big part of the dive flow. In this chapter there is example on what to focus on during doing canopy handling jumps.

53.1 Conditions

Always check conditions before boarding. Notice wind direction and if there is a lot of turbulence and effects of turbulence to landing area and reserve landing areas. When visiting a new landing area figure out the special characteristics of that landing area and obstacles such as power lines and buildings. Do not perform show jumps without seeing the landing area first.

53.2 Preparations

Planning a skydive also includes part where you plan your flight path under the canopy. Think about other skydivers in the load, their canopies and way of flying. Discuss together with the load master about exit order, deployment altitudes, landing order and landing area and -direction. This way you can plan together and landing order should be the same than exit order (especially during low altitude jumps), so you don’t have to pass others in the air and you don’t have to land close to another skydiver.

53.3 Actions in the plane and exit

Do mental training during the climb and also mentally prepare for the canopy ride and landing. Observe wind speeds from the speed you are travelling in relation to the ground and make sure you jump out at correct exit spot even if you are not the first one to exit. Do not jump if you are not sure where you are and can you make it back to the landing area.

53.4 Freefall and deployment

Check during freefall your location in relation to the landing area. If necessary, deploy little bit higher than planned (remember to signal others you are about to deploy), so you can be sure you make it back to the landing area. Remember good deployment body position, especially classes 4-6 canopies are really sensitive for deployment body position and might cause malfunctions if not deployed well. Notice others by keeping a good exit separation since that will help if you need to deploy a little bit higher than planned. After deployment observe your airspace and avoid collisions to the right if necessary. Turn away from the jumprun before doing other tasks such as pulling your slider down or loosening your chest strap.

53.5 Actions under the canopy

Under the canopy observe traffic with relation 90% airspace observation and 10% landing area observation. Notice others and hold if necessary, if you have small and fast canopy and you are at low altitude in relation to others, be little bit quicker, if you are above others, spot a suitable gap in traffic. If you have big and slow canopy and you are already in the pattern, try to plan when others can pass you, you want others to pass you in crosswind leg rather than in final approach.

53.6 Accuracy trick

Accuracy trick is a simple way to determine can you make it to the landing area with your canopy. First locate a fixed point from up front in the ground that looks like it is not moving upwards nor downwards in your vision. This fixed point is the spot you end up if you don't change the status of your canopy or wind doesn't change dramatically at lower altitude. Test where the accuracy point moves when you in tail- and headwind:

1. Slow down your descent and speed by using your toggles.
2. Pull down rear risers slightly to make the canopy glide better.
3. Pull down front risers to make the canopy dive.

This way you know how to fly your canopy when trying to get back to the airport from a long spot.

53.7 Toggles or risers?

In general, in tailwind canopies fly further by using half braked position by toggles. This is a result from the descent rate that is lowest when flying with braked position. Compared to full flight status the air speed is low and it takes skydiver travelling in a tailwind far without losing altitude too much. However, when flying in crosswind wind might take skydiver too far to the side. This is a

case where skydiver should use rear risers instead toggles. Then air speed forwards is higher and the effect from the crosswind is smaller.

Usually if your exit spot has not been far away from the landing area it doesn't matter which method you choose. So following things might help with your decision. With risers tolerance is only few centimeter. Hands are high and blood flow is lower in hands. Risers pull down C- and D-lines and changes the shape of whole canopy. That is the reason there is usually more force required. Don't squeeze the risers, stick your fingers through the lines just above the risers and this way it is also easier to spread the risers.

With brakes the tolerance is bigger. Hands are at heart level and blood flow is better. While keeping hands through the toggles it might be a good idea to grab additional help from the harness. Depending on the features of the canopy 60% brakes might be the best status to fly while travelling far. If travelling really far it might be a good idea to leave brakes on after deployment to further improve resting your arms. Remember that the canopy needs to be in fully flying status by 600m altitude, including toggles! However if you are in the down side of the wind and flying towards headwind, brakes are not the best idea. In this case it is better to use risers.

53.8 Landing

Decide on your landing area by 600m altitude and after that focus only on landing. If exit spot is wrong, use accuracy trick and pick your reserve landing spot with enough altitude. Agree on and plan landing pattern in advance minding obstacles, traffic and conditions. Avoid landing straight at the same spot than others and at the same time. It is better to walk 100 meters with your own feet than get in to an ambulance next to the packing hall. If you are planning on doing high performance landing, do it far away from others and with enough altitude according to the features of your canopy.

53.9 Last meters

Don't change your landing plan on last second, since that is a factor in many accidents. Learn different landing techniques in good weather (chapter 51). Find your own and your canopy limits so you can perform well in tight situations. Avoid using always same landing technique or same side landing pattern (unless it is enforced by your dropzone).

54 Canopy handling exercises

On every skydive you should, if possible, learn canopy handling, such as accuracy trick or using your rears and toggles. When you jump with a new type or size canopy, perform at least jumps 1–3 from chapter 17.2–17.4 and jumps 1–4 from chapters 54.1–54.4. Only after that use the canopy on other skydives. This way you get practice on canopy flying and landing before you need to focus on other things.

This chapter has five practice jumps. They are done usually during canopy handling course. Things done during the jumps are usually new information for skydivers so some of the things might not

work out at first try. This is the reason things practiced during the course should be practiced even after the course.

Remember to figure out wind direction and speed on all layers before each jump. Follow also other skydivers on previous loads.

Always remember good exit separation (at least 5 seconds) and landing order. Take in to account club specific rules and practices. Exit order is the same than landing order, so discuss with other skydivers about the exit order before boarding the plane. If lower altitude skydiver looks to be too close, fly in half braked position (or even in full braked position over 600m altitude) to get more separation.

Notice that canopy must be flyable by 600m and brakes has to be opened!

54.1 Jump 1

Purpose for this jump is to learn accuracy trick. Altitude is at least 2000m, 2-5 second delay and deployment. If more than one skydiver exits from the same jumprun, first to exit can take a little more and last to exit little less freefall before deployment.

Try to steer from the rear risers before releasing the brakes and turn away from the jumprun, this is a good way to practice avoiding collisions right after deployment.

Open the brakes and try to locate accuracy point that is not moving upwards or downwards in your vision. Start around 30 degrees below the horizon and start slowly moving your vision downwards until you have located the point. If you don't use your brakes or toggles you will end up at that point. Remember to observe airspace and traffic throughout the jump!

If you have difficulties locating the point, try again with lower altitude. Lower you are, easier it is to locate the point.

When you locate the point, observe what will happen to it when you first brake a little and then little more. Try this also to crosswind and headwind, since it has a different effect on depending on the wind direction.

Try same by using both, rear- and front risers.

Don't worry if you don't have time to try out everything during one jump. Practice takes time and you can continue during future jumps.

Prepare for landing pattern while respecting landing order. Perform a correct flare from full flight status.

54.2 Jump 2

Purpose of the jump is to learn turns in different flight statuses, furthermore, practice accuracy trick and to learn landing pattern in half braked position. These skills might be handy if for

example you need to land to a reserve landing area or during show jumps. This practice should not be done if there is a lot of turbulence.

Exit altitude at least 2000m, 2-5 second delay. Remember to turn your canopy away from the jumprun after deployment.

Release the brakes, try at least two 90, 180 and 360 degree turns to both sides with different flight statuses (half brakes, full brakes). Remember that with half braked position you can turn by either pulling one toggle or releasing one. With full braked position you can only release opposite toggle.

At this point is to try accuracy trick again and how brake usage and riser inputs effect on it.

Prepare for landing pattern and respect landing order. Fly entire landing pattern with half braked position and do not brake more than that. This way you can gain more separation even at lower altitudes, this is important if you need to land with others to a tight landing area.

If weather is unpredictable and you feel turbulence, lift toggles little, or even to full flight status.

Notice how flying brakes effects on distances travelled during the landing pattern. Notice also how much time there is more in comparison to normal landing pattern.

It is good to try accuracy trick during the landing pattern, but it is extremely important to observe traffic during pattern in order to avoid collisions.

When you have turned towards your final approach, calmly lift your toggles up and perform normal flare from full flight status.

54.3 Jump 3

Purpose of the jump is to learn landing in cross- or zero-winds. This is good to practice even before you are actually in a situation you don’t have options or before you get a smaller canopy. Usually there is less wind during mornings and evenings.

Technique in cross- and zero-winds are the same. If there is absolutely no wind, you can fly landing pattern normally.

In other situations landing pattern must be planned in a way that the final approach is to crosswind.

Remember while planning that also tailwind leg in pattern is not in tailwind, and final approach is not headwind, so remember to leave enough tolerance for errors.

Remember to discuss with ground personnel and rest of the load in order to inform every one of your plan. The best situation is when the whole jumprun lands to same direction. You can also use markings on the ground to show the landing direction.

Exit altitude and delay is the same than during previous jumps.

While landing in cross- or zero-winds it is extremely important to perform flare well and at right time. It is also important to fly the canopy all the way to the ground.

During these landings focus on following points:

1. Flare is done little bit higher than normally, around 1m higher. This means time wise less than one second. Flare is started from full flight status. Beginning of the flare must be sharp and you need to feel pressure in your leg straps. Canopy must straighten its' path ("lift").
2. Kill the speed by calmly adding brakes. Remember to pull both toggles all the way down in a way that your arms are completely straight close to your body. If arms are left in front or to the sides, you haven't braked all the way. Last 10–15cm makes a big difference in landing. Try this at least couple of times.

Prepare pattern and respect the order. Remember in final approach to fly full flight position and remember previous points while flaring. After a sharp start, add brakes slowly and calmly until touchdown. Prepare to run or PLF. Remember to kill as much speed as possible before touching down to the ground.

54.4 Jump 4

Purpose is to learn how to flare from half braked position and where is a stall point of the canopy. This is useful if you need to land to a tight spot and fly pattern including final approach is flown in half braked position or if you need to avoid collision in lower altitudes.

During this jump you fly a lot in full flight position. It might be a good idea to take exit spot little bit further than normally.

Exit altitude and delay is the same than during previous jumps. Remember to turn your canopy away from the jumprun.

Release brakes and let your canopy fly for several seconds. Then bring your toggles to your waist level. Fly this way about 10 seconds. If canopy is stable, add brakes about 5cm and fly the next 10 seconds. If still stable, add brakes and continue, remember to let the canopy fly after each addition to brakes. If at some point canopy starts to swing sideways or falls backwards, it means that canopy is stalling. Lift toggles calmly to a full flight status.

Repeat, this time toggles should be 15–20cm higher than previously when it started stalling. Fly about 10 seconds and add little bit brakes, repeat until stall. Observe how the canopy acts and remember to observe your airspace and location.

Always lift your toggles calmly and symmetrically1 Otherwise canopy dives quickly and that might cause twists to your lines.

Try twice more so you are sure where the stalling point is. Try also pulling toggles quickly to the stalling point, does it stall?

Next pull your toggles to half braked position and fly about 10 seconds so. Try flare from that status. In this case there is only one, quick motion downwards all the way down. Do you notice a difference between this and normal flare? If canopy stalls during the pull or right after it, try again. This time don't pull toggles so much down. Canopy should be flying at least couple of seconds after the flare before stalling. Also try this couple of times more.

If the canopy stalls easily, it might mean that the steering lines are too short. Discuss with your rigger.

Landing pattern can be either full flight or half braked status depending on for example what is the separation to other skydivers. Remember to set yourself to half braked position at latest when turning to final approach.

Flare is done from half braked position, prepare to PLF.

54.5 Jump 5

Purpose of this jump is to fly close to another skydiver and see how brakes and other techniques effects on angle of attack and speed.

Exit spot should be 4–6 times further than normal. Notice possible reserve landing spots while planning the exit spot. This jump should not be done during higher upper winds.

Discuss with the pilot about the jumprun in advance. Remember to take your phone with you.

When you choose a partner, take loading in to account in a way that there is not a big difference in it. This way it's easier to stay at a same level in air.

Exit altitude should be as high as possible, 3000–4000m, 2–5 second delay before deploying. Exit separation between skydivers 5–8 seconds.

Always make sure before approaching other canopy in the air that they can see you. You can plan some signal, for example waving your legs to give permission to approach.

Remember turbulence behind other canopies, if you approach from the back. If you drift behind or above other skydiver and you feel turbulence, brake a little and turn slowly to the side.

At the beginning focus on flying at the same level with another skydiver. Use brakes or rear risers if you want to get higher or brake. Use front risers if you want to fly faster and with steeper angle. You can also open up and close your body position and see how that effects.

The best way is to fly in a way that one skydiver acts as a base, flies straight and calmly and navigates while other tries to get close. When other approaches, you can do couple of turns together and switch positions.

Break-off at 800–1000m altitude.

Prepare landing pattern with respect to landing order. Final approach and flare is done from full flight status.

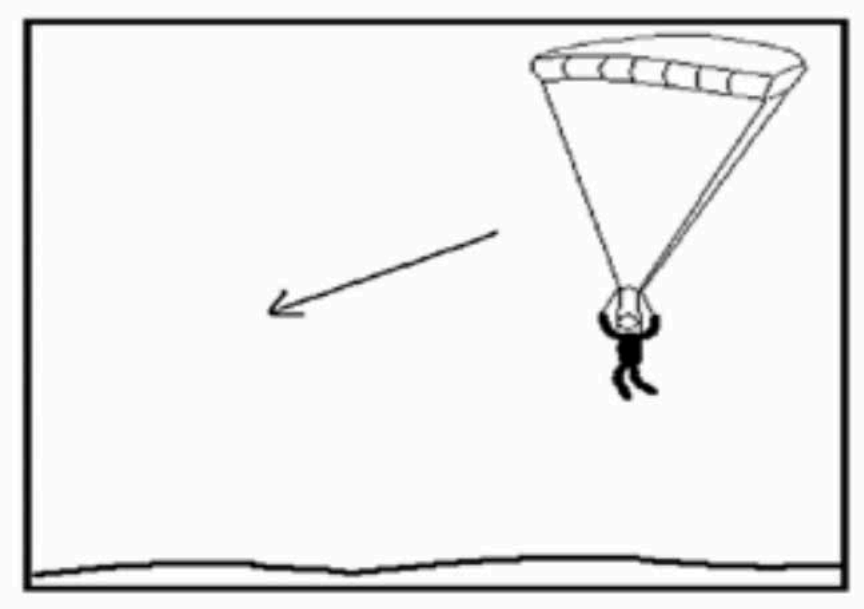
54.6 Video

Taking a video of landings is fundamental part of learning. Mistakes are often happened within short time window and is usually visible on after slowing video down, or even taken frame by frame. Discuss in advance about taking a video with another skydivers. Discuss about the spot you are about to land to, landing direction and where the camera person is. Discuss also about landing order so there is only on skydiver landing at the time. If there are other skydivers in the load, avoid landing close to skydivers who are making a video of their landings.

Plan the spot in a way that sun is not directly behind approaching skydiver while in final approach. Best place for sun to be at is behind the camera. If you start the video while skydiver is in tailwind leg of the pattern, sun can cause temporary blindness. Avoid dark background, for example evergreen forest. When skydiver goes below the tree line, difference in lighting might be too fast for the camera and it might also be hard to see hand movement against dark background.

While taking video from a landing skydiver position skydiver in the frame in a way that he/she fills two thirds vertically and there is empty space in front of the skydiver.

So called action cameras such as GoPro or Garmin are not good for landing videos. They use wide angle and they can’t zoom so skydiver would be sharp in the frame throughout the landing.



54.1. Frame should look like this.

try to keep ground visible as reference to see the starting point of flare. Avoid taking the video from far away by zooming back and forth. Take a video from the same level where skydivers land. Camera should be positioned in a way that whole skydiver with canopy, both hands and movement direction is clearly visible. Position yourself in a way that final approach is in about 45 degree angle and speed is killed before reaching the camera level. From video taken straight up

front you cannot see forward motion and from straight side view video you cannot see the other arm. From the back and slightly from the side you can see all of these motions well.

When you take a video, focus only on taking the video, do not try to evaluate the landing at the same time. Evaluation time is later and done from the video.

While you evaluate jump from the video, focus on following points:

1. Canopy and position in relation to horizon (is it level?).
2. Arms, you can see steering and possible mistakes from them.
3. Tail of the canopy, you can see if flare is symmetrical and how much the canopy brakes and are steering lines too long or short.

55 High performance landings

Before you start pulling front risers for speedy landings, make sure your steering lines are long enough and that your front risers have loops on them to grab. Correct length for steering lines is when there is about 10–20cm slack while in full flight and lines are slightly curved in flight from tail of the canopy towards the metal loops they go through.

If steering lines are too short, you are also pulling the tail of the canopy downwards while you pull on front risers. This might cause wobbling or other instability. If canopy at some point seems unstable, stop trying. Always keep your toggles in your hands when pulling risers for steering or landing. One or both toggles lost right before hitting the ground is extremely dangerous. Practice with enough altitude at first all things included, and then start bringing them to lower altitude.

Before you perform high performance landings to the ground, remember that you have to practice all things related numerous times with higher altitude (over 600m), so you know well, how much altitude is lost during high performance landing and you develop muscle memory for safe landing with higher speed.

These jumps should be focused only on high performance landings and not to practice anything during freefall. Best is to jump out from low jumprun and land further away from other skydivers.

These jumps should never be practiced alone. Always ask for guidance from more experienced skydivers and go through them with a coach, since these actions performed incorrectly might cause serious injury or even death!

Remember that everyone learns with their own pace, don’t listen to other is they push you too fast or it doesn’t feel safe.

Learn to say no to high performance landings:

- When there is a lot of traffic in the air or in the landing area.
- While landing to a new place.
- With marginal weather.
- When you are tired, angry or not happy with your performance in freefall.

Remind yourself that you can do high performance landing on a next jump when conditions are more suitable. It is possible only if you survive this jump!

55.1 Toggle turn for gathering speed

Don't do this! Turns done with toggles at lower altitude is dangerous regardless of if they were done accidentally or on purpose. They are even more dangerous than high performance landings done by pulling front risers. When performing the turn you are using the tool that would be used to bail out from the turn and recover from the dive. In other words bailing out from the turn might not be an option.

All canopies have safer long flares by using the front risers to gather the speed.

55.2 Straight speed gathering by pulling front risers

Safe way to add speed for landing or add length of the flare is to add air speed by pulling down both front risers. Amount to pull is depending on the type of the canopy, but in general around 5–20cm. When both risers are pulled down, balance under the canopy shifts backwards, glide path gets steeper and descent rate gets higher. This way we get more speed that can be turned to lift during flare. Front risers are released slowly and not quickly, since then canopy aerodynamic features are working the best way. When risers are released, canopy starts to flare by itself when balance is shifted back forwards and glide path is getting flatter. This usually occurs 1–3 seconds after releasing the risers.

Correct straight high performance landing is done by pulling both front risers down, fly around 3–4 seconds and release risers slowly at altitude from where the canopy starts to flare before the ground. After this skydiver continues the flare by pulling toggles to kill the speed completely.

If you release risers at altitude from where you need to start pulling toggles right away to avoid colliding with the ground, you have done so too low.

This action should be practiced numerous times with higher altitude and learn accurately how much altitude is lost from when you pull the risers to the point when flaring stops. This information is necessary to know when to start pulling the front risers. After this you can start practicing at lower altitude.

At this point most important things to learn are:

- Learn from which altitude to start gathering speed.
- Learn when to stop in order the canopy to start flare before the ground.
- Stopping at correct altitude so you don't need to force recovery and canopy doesn't recover too early.
- Learn how to bail out safely.

Usually it takes tens of jumps to learn points above.

Never rush your practices. The better you learn the basics the better you can develop in future new things and you most likely will survive without serious injuries.

It is suggested to ask from a coach opinions about your landings and if there is something to improve.

If you receive guidance from your friends or find tips online, always ask about them also from your coach, since unprofessional guidance can be dangerous!

55.3 Gathering speed by turning with front risers

Before you progress, you must make sure that straight in landings works every time and previously listed points are understood, if you are not sure, you should practice more.

Gathering additional speed by turning is always dangerous, since the diving speed gets much higher and stopping the descent quickly is hard and you might not be able to see all the traffic. Practice turning with front risers first with higher altitude and observe how pulling front risers effects on speed, descent and overall on the canopy. By pulling too much might collapse end tunnels and it is dangerous at lower altitudes.

For landing it is always suggested to start speed gathering high enough for the canopy to recover and you must always be able to bail out if necessary. This is the reason whole turning sector should be cleared from obstacles make sure you can land to whole sector. If during gathering speed it seems like the altitude is not enough, never quicken the turn to get to headwind, just bail out from the turn or turn the canopy while flaring. At this point you should be familiar with these concepts, if you are not, stop practicing these and focus on basics.

While pulling one front riser the side of the canopy glide angle gets steeper and weight under the canopy is shifted to the opposite side and that causes a turn towards the pulled riser. Descent rate gets higher. While airspeed and descent rate gets higher the front riser starts to feel heavier. If pulled too much or during turbulence there might be a serious malfunction if angle of attack turns negative and nose of the tail is turned downwards and inwards.

Best and the safest way to gather speed by turning from a front riser is to perform slow and steady turn where speed raises slowly. In this way it is always possible to bail out from the turn and recover to level flight in small time window. Start with slow 90 degree turn and go to higher turns only after 90 degree turn works out every time accurately and safely. Usually this takes at least tens of jumps. If you feel after couple of jumps that you already know everything, you should ask help from your coach, since at this point there is much to be learned. If you have to recover the canopy by pulling your toggles to avoid collision, you have started gathering the speed too low. Always prepare to bail out by using toggles, if turn looks like going too low.

Quickly performed snapping turns are especially dangerous, since airspace observation is difficult and recovering from the turn takes more time and altitude compared to a slow and steady turn. When you have done quick turn it will take more time to regain the control. Over 180 degree turns are especially dangerous.

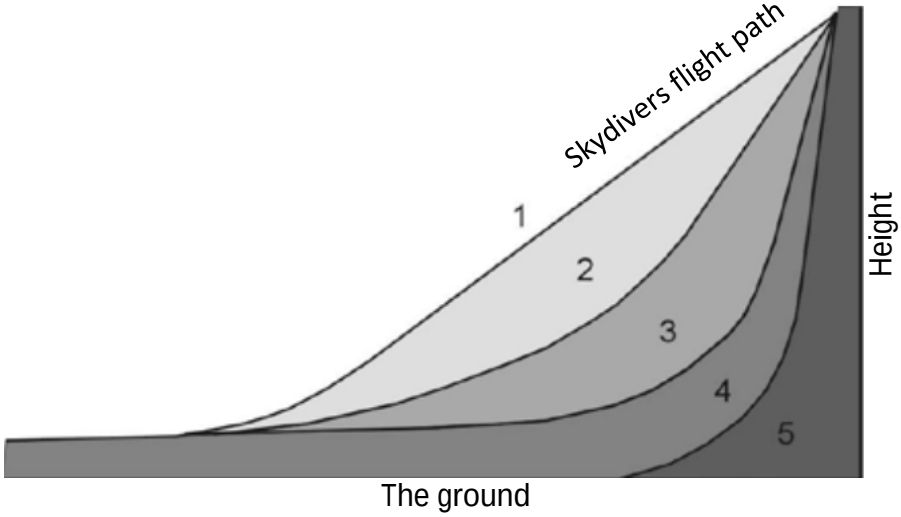
55.4 Corner

As stated before, regardless on used technique, you need to be able to stop at an altitude where canopy starts to flare by itself before the ground. This way you can do speedy landings relatively safe (extra speed is always a risk).

This way it is also most efficient, since by using toggles or rear risers you always eat away speed. Best is to let canopy to start the flare and then add calmly toggles or rear risers.

Chart below shows canopy flight path at end part of high performance landings where skydiver releases front risers at different stages.

Situations 1 and 2 are relatively safe. Situation 3-5 skydiver is in so called corner. This means that at the end stage the canopy flight path is not flat and steady and skydiver must use quick actions to get the canopy recovered. This is insufficient and dangerous!



55.1. Flight path in different situations.

1. Straight in approach and normal flare is the **safest way to land!**
2. Straight approach by both front risers or slow and steady turn canopy starts to flare by itself if risers are released with enough altitude. **Relatively safe way to land.**
3. Steep turn with low altitude by using risers or toggles. Canopy recovers only by using toggles. **Risks are getting higher.**
4. Too low or too steep turn by risers or toggles in corner. Might be impossible to recover. **Serious danger.**
5. Too low turn by risers or toggles, impossible to recover. **Accident.**

Different canopies demands different techniques to gather optimal speed. These includes for example started gathering speed by first pulling both front risers and then turning by using your harness while still pulling both front risers. These things are however for advanced skydivers who has experience and has been in numerous courses for high performance landings.

56 Canopy handling: epilogue

Now you should have a good grasp on how canopy flies and to where the features are based on. This guide does not make you a good canopy flier or swooper. Learn to fly your canopy in practice and compare the theory you read to your own observations. Think about these theories while jumping canopy handling jumps. You might notice new features from your canopy or find completely new ways to control your canopy. Hopefully you now also understand in different situations why your canopy acted as it did. Always remember that in skydiving learning does not stop. Discuss with more experienced skydivers, ask about their opinions and read a lot about different sources on this sport. Compare this guide to information available. Have fun under your canopy!

There is a lot of high level canopy coaching around the world. Skydiving Committee warmly recommends you take part in these. Coaches in these courses often have thousands of jumps on their belt and they do it as a profession. These courses have valuable practical info and feedback from professionals and you can find courses for all skill levels.

Also Finnish canopy coaches give good coaching. You can find a list of coaches at parachuting committee website.

Parachuting Committee wishes you safe jumps and soft landings!

More material:

- *Germain, Brian*: The parachute and Its Pilot: Bigairsportz.com.
- *Performance Designs*: performancedesigns.com/resources.
    - The lockdown on low turns.
    - Choosing the right canopy (1 and 2).
    - Survival skills for canopy control.
    - Wing loading and its effects.

Part VII – Appendix

Table of contents:

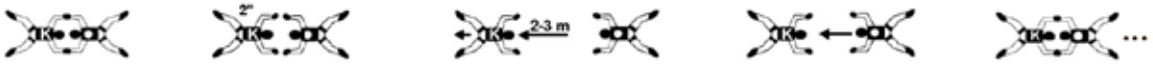
FS-JUMP PROGRAM

- FS-program includes nine jump and techniques related to them. Instructor or coach chooses best suitable jump for students level of progress, not all are necessary to jump.
- Jump number (1–9) is marked to logbook with evaluation.
- It is not recommended to advance before student handles previous jump relatively well.
- During evaluation priority is safety and small priority for successful execution of the plan. Check more in Skydivers Guide.
- **First group skydive** focus is only on proper body position and altitude awareness.
- Exit is done as easy as possible for the student.
- Before exit go through the plan on the ground (standing and with boards) and exit in a mock-up and at the plane.

Hand signals used:

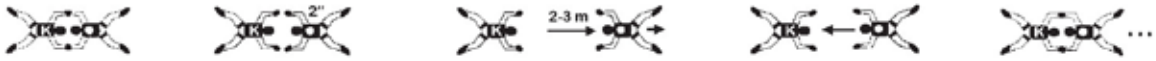
JUMP 1: *Movement forwards*

After the exit relax, take a basic body position and turn towards your partner. Fly forwards to your partner, take a wrist grip and basic body position, check altitude and fly your slot. After the partner gives you a signal, release the grip. Partner waits for couple of seconds and moves slightly backwards. Repeat movement forward.



JUMP 2: *Movements forwards and backwards*

After the exit relax, take basic body position and turn to face your partner. Fly to your partner and take a grip from the wrists. Fly your slot correctly. Check the altitude and release the grip once there is no pulling. Wait for couple of seconds and move couple of meters backwards. Repeat.

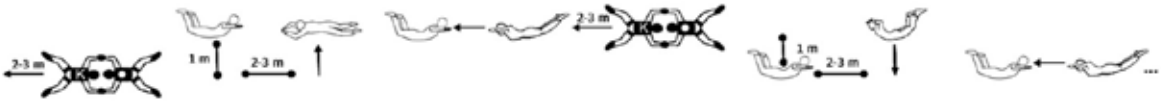


JUMP 3: *Movement upwards and downwards*

Fly to your partner and take a grip. Check the altitude and fly your slot. Partner gives a signal to release and then uses "cupping" to move slightly upwards. Reduce the arch and move up to your partner. Partner then arches and moves slightly down. Add arch and move to same level with your partner. Don't take grips after the first release. Partner keeps a distance in a way that even when pushing your head against the airflow you can still maintain eye contact. Keep symmetrical body position. Repeat.

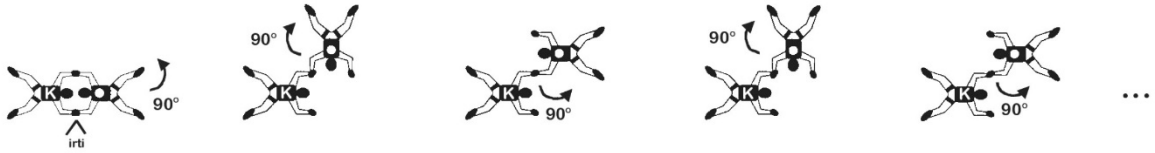
JUMP 4: *Vertical movement combined with movement forward*

Fly to your partner and take a grip. Partner moves slightly backwards and upwards. Reduce arch, fly forwards to your partner and take a grip. Fly your spot. Partner moves slightly backwards and downwards. Arch and move to your partner, take a grip and fly your slot. When moving, always try to move to the same level before moving forwards. Maintain eye contact. Repeat.



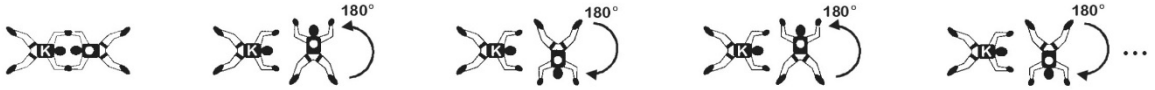
JUMP 5: *90° turn*

While turning, keep your partner as a point of reference. Turns are done from a half star to an open accordion and back to half star. Fly to your partner and take a grip. Partner gives a signal, release your left hand grip and formation is opened 90 degrees to a half star. When there is no pull on the formation, give a signal. After the release wait for a second before starting the turn. Turn 90 degrees to right and take a grip with your left hand (open accordion). Give a signal and turn back to half star. Make sure that you are on a same level than your partner when taking grips. While moving between formations, remember to turn first and take a grip after the movement has stopped. When taking grips make sure it is light and fly your slot. Do not pull your partner. Repeat.



JUMP 6: *180° turn*

Fly to your partner and take a grip. Turn 90 degrees right and stop without any grips in a sidebody-formation. Maintain distance and angle for a while and turn 180 degrees to the left to a opposite sidebody-formation while keeping your partner as a reference. Maintain distance and angle for 2 seconds. Stop between turns so you can focus and observe that turns are not going over 180 degrees. If drifting away from your partner, turn right away towards your partner and continue turns to another direction. Repeat.

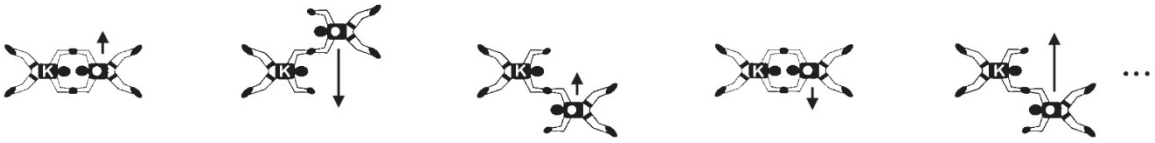


JUMP 7: *360° turn*

Fly to your partner, take a grip. After partner gives you a signal turn 360 degrees to the right. Use arms and legs to turn. Remember a symmetrical basic body position, start-coast-stop and take a grip. Turn 360 degrees to the left. Be patient before starting a new turn so that the formation is over before starting the turn. Remember to maintain levels. Remember to start stopping the turn before it is done, so it will not turn more than planned. Repeat.

JUMP 8: *Movement sideways*

Start in a star and move sideways to an open accordion. Then move to another side open accordion. And back to star. Fly to your partner and take grips. Move right, stop and take a grip. Move left, stop and take a grip. Repeat.



JUMP 9: *Approach sideways*

Start movement in front of your partner and turn 90 degrees to the right and after that move sideways towards your partner so he/she can take a grip. After this partner gives a signal and releases grips. Fly to your partner and take a grip. Turn 90 to the left and move sideways towards your partner. Remember to use your whole body to move sideways. Try to perform turns calmly to avoid turning over. Repeat.

FREEFLY JUMPS

- Practice each task before the jump.
- Get familiar with safety issues in freeflying and take them in to account while planning.
- Mark chosen jump (1–3) to logbook.
- For evaluation, check Skydivers Guide.

Jump 1: *Back-sit-back transitions*
Use exit that is familiar to you. Turn to your back and make sure you are stable before moving forward.

Goal of the jump is to maintain good and stable body position on your back, transition up to sitting position and back down. If you are able to get up to sitting position or if you lose control of it, get back down to your back and repeat the exercise.

Other things to take in to account:

- Altitude awareness in different body positions.
- Freefall time reduces since the speed is higher.
- Work across the jumprun.

Jump *2: Exit to sitting position*
Goal of the jump is to maintain sitting position straight from the exit. Exit can be performed either belly or back towards the ground, so the relative wind comes from a right angle. From this point on, practice sitting position like in first jump. When you lose sitting position, get down on your back and lift yourself back up. If position feels controlled, you can stay in sitting position for a longer time.

Jump 3: *Controlling sitting position*
Goal is to stay in sitting position and prevent drifting. Check chapter 41.2.3.

Other things to take in to account:

- Work across the jumprun.
- It is usual that in the beginning your body drifts backwards because you are leaning slightly forward and you might not notice it.
- Focus from the beginning that you keep your chin up, shoulders back, chest open and press upper body backwards. This way the position stays in place, or if pressed enough backwards your position will move even forwards.

CANOPY HANDLING PROGRAM

- Practice all actions with an instructor before the jump.
- Going through the jump program requires good weather conditions. Also above 600m altitude.
- Below 600m start preparations for landing pattern. Do not make aggressive steering movements below 600m since it might result to malfunctions.
- During canopy handling jumps there is no actions in freefall.
- If possible, canopy handling jumps should be jumped as first jumps in Advanced training and continue to practice learned things on rest of the jumps.
- When student receives permission to use own gear, or gear that is not designed for student skydiving, canopy handling jumps are jumped before other jumps and on a row.
- Jumped skydives are logged and evaluated to logbook and advanced training certificate.
- Further information: Skydivers guide chapter 17 and part VI *Canopy handling guide*

Jump 1

Goal is that you learn the features of your canopy and you learn to perform correct two-staged flare.

Exit altitude is at least 2000m. Deploy after about 5 seconds. Remember club- and airport specific things regarding deployment altitude.

Before releasing the toggles, check your airspace and try steering from the rear risers. Make at least two 90 degree and 180 degree turns both directions. This is a way to practice avoiding collisions right after deployment.

Release the brakes and find the stall point on your canopy by slowly adding more and more brakes. If canopy does stall, lift toggles slowly and symmetrically. If there is enough altitude (over 1000m) left, practice this 2–4 times.

After this practice flaring from full flight position. Remember sharp first stage and then slowly apply more brakes to keep the canopy flying horizontally. During the first stage notice the G-forces getting higher and canopy transferring to horizontal flight.

Prepare for the landing pattern and respect the landing order. Perform correct flare from full flight position. If you did not land where you wanted, think about why and discuss with your instructor how you could fly the pattern differently (for example different starting point, earlier turn to the final and so on).

Jump 2

Goal is to learn to fly half- and full brake positions.

Exit altitude is at least 2000m. Deploy after about 5 seconds. Remember club- and airport specific things regarding deployment altitude.

Before releasing the toggles, check your airspace and try steering from the rear risers. Make at least two 90 degree and 180 degree turns both directions.

Release the brakes. Brake to a half-brake position (toggles on your shoulder level). In this position try at least two different turns (90, 180, 360 degrees to both directions) both by pulling one toggle down and by lifting one toggle up. During the whole exercise fly in half-brake position and do not release the canopy in to a full-flight position.

Brake to a full-brake position (toggles on your waist level). In this position try at least two different turns (90, 180, 360 degrees to both directions) by lifting the opposite toggle up. During the whole exercise fly in full-brake position.

After these if altitude allows (more than 700m), try 2–4 times flare from a full-flight position.

Prepare for the landing pattern and respect the landing order. Perform correct flare from full flight position. If you did not land where you wanted, think about why and discuss with your instructor how you could fly the pattern differently (for example different starting point, earlier turn to the final and so on).

Jump 3

The goal is to learn how much altitude you lose with different kind of turns.

Exit altitude and freefall is the same than during previous jumps.

Before releasing the toggles, check your airspace and try steering from the rear risers. Make at least two 90 degree and 180 degree turns both directions.

Release the brakes and check airspace and altitude. Try one calm and one quicker 90 degree turn from full-flight position and check your altitude after each turn and observe how much it did drop. Notice the airspeed getting higher compared to a student canopy. Try the same with 180 degree turns.

Check airspace and altitude. Try quick 360 turn and stopping to a pre-defined direction. Notice how airspeed gets higher and altitude drops more quickly. Notice how much earlier the turning must be stopped so the canopy will stop turning to a correct direction and how big of a counter action it requires to stop the turn. Observe the loss of altitude while turning and try the same with calm 360 degree turn.

After these if altitude allows (more than 700m), try 2–4 times flare from a full-flight position.

Prepare for the landing pattern and respect the landing order. Perform correct flare from full flight position. If you did not land where you wanted, think about why and discuss with your instructor how you could fly the pattern differently (for example different starting point, earlier turn to the final and so on).

MENTAL SIDE OF SKYDIVING: CONTROL YOUR FEAR

Everyone is scared or worried about their first jump, so you are not alone with those feelings. Fear is a natural reaction to a situation that is unfamiliar to us and we feel that it contains a threat. We might be scared of a different things in skydiving: one might be afraid of the plane ride itself, one is afraid of the deployment or landing. Especially during the first jumps people usually fear the loss of control and unfamiliar situation. Physiological symptoms or fear are for example oppressive feeling in chest, sweating, tremor, elevated heartbeat, difficulties to breath and dizziness.

Good news is that even if you feel even panic, you can learn to control it. One of the best ways to overcome fear is repetition. With repetition fear fades and shifts. On top of this you can do simple tricks and exercises to control your fear.

Be aware and identify

First step is to admit that you are scared and take that feeling under observation. With denial you cannot work on them and they will build up and get stronger. Discuss with your instructor or more experienced skydivers or even with someone on your course about your fears. What are you afraid of and how much? When you are actually in the middle of a skydive, it might not be the best thing to focus on the fear itself, instead you can try and take your mind away from the fear and think about nice things. You should try following exercises!

- **Breathing- and relaxing exercises.** When we are scared, we usually tend to breath shallow breaths and then our muscles and brains won't get enough oxygen. Shallow breathing also elevates our heartrate that only builds up to our fear reaction. With breathing exercises our heartrate calms down, blood pressure drops and our ability to focus elevates. Easy relaxing exercise to the plane is following "4 – 7 – 8" exercise:
    - Empty your lungs.
    - Breath in through your nose and count to **four.**
    - Hold your breath and count to **seven.**
    - Let the air flow out through your mouth while counting to **eight.**
    - Repeat as many times as necessary.
- **Smile.** Smiling makes our brains to release stress reducing and good feeling adding neurotransmitters in our brains and relaxing gets easier. When you smile, your brains makes a signal, everything is fine! You can artificially cause the same effect. Hold smile (even if you have to force it) for 30 seconds non-stop. Your brains do not understand if we are smiling on purpose or accidentally.
- **Focus on positive:** Focus on the feeling that you are going to achieve after the jump even before you start gearing up. Nothing beats that feeling that you have overcome your fears. Focus in the plane and during the jump on that feeling. Remember to congratulate yourself after the jump!

If skydiving is something you want to do, but fear feels uncontrolled or too much to overcome, you can seek for professional help.*

**In Finland there are skydiving specialist psychologist and mental trainer Leena Väistö (flyingmind.org) and NLP-trainer and mental trainer Minna Marlo (minnamarlo.com)*

HAND SIGNALS

	**PULL: Deploy right away without deployment signal with normal cycle: ARCH-REACH-PULL 101.....105 check canopy**
	**COA: Heading, altimeter, Left instructor, right instructor**
	**CHECK YOUR ARMS: Make sure your arms are in "box". 90 degrees from your body and 90 degrees bent in elbows.**
	**LEGS OUT: Push your legs out for 10-15cm symmetrically and keep them there.**
	**LEGS IN: Pull your legs for 10-15cm symmetrically and keep them there.**
	**TOE TAPS: (when fingers move quickly) Tap your toes together.** **NARROW YOUR LEGS: (when fingers move slowly) Put your legs slightly closer together.**
	**PRACTICE PULL: Perform practice pull and use normal procedure (ARCH-REACH-PULL) but do not pull, keep your palm open over the handle.**
	**ARCH: Press your pelvis downwards and maintain symmetrical body position.**
	**RELAX: Relax and breathe**
	**OK!: Everything is okay.**

TRAINING PROGRAM

Jump / Altitude SL		Jump / Altitude AFF		Plane	Canopy handling	Freefall	Gear	Other
Elementary training								
1: SL	1000 m	1: Level 1 (2 Instructors)	3000–4000 m	Actions while loading the plane, Gear protection, Airspace check, Exit	Independent steering, Landing, Safe canopy flight	Independent freefall and deployment	Gearing up, 3x3-Checks	Radio on three first jumps
2: SL	1000 m	2: Level 2 (2 Instructors)	3000–4000 m					
3: SL	1000 m	3: Level 3 (2 Instructors)	3000–4000 m					
4: Practice pull	1000 m	4: Level 4 (1 Instructor)	3000–4000 m					
5: Practice pull	1000 m	5: Level 5 (1 Instructor)	3000–4000 m				Packing a student canopy	
6: Practice pull	1000 m	6: Level 6 (1 Instructor)	3000–4000 m					
7: 3"	1100 m	7: Level 7 (1 Instructor)	3000–4000 m					
8: 5"	1200 m	8: Level 8 – 15"	1800–2500 m					
9: 10"	1600 m							
Basic training theory exam								
Basic training								
10: 15"	1800 m	9: 8"	1600–1800 m	Exit spot determination, Exit order, Independent actions in the plane, Exit styles	Sharp and symmetrical flare, Adjusting pattern to wind conditions, Holding	Low altitude (AFF), Movement around three dimensions, Track	Starting to use skydiving gear and checks	Weather, HD-system (if necessary)
11: Floating exit	1800 m	10: 5"	1300–1500 m					
12: Diving exit	1800 m	11: 5"	1300–1500 m					
13: 360°	2400–4000 m	12: Back fly	2400–4000 m					
14: Back fly	2400–4000 m	13: Track	3000–4000 m					
15: Barrel & Back flip	3000–4000 m	14: FS-track	3000–4000 m					
16: Track	3000–4000 m							
17: FS-track	3000–4000 m							
5 exit spot determinations, landing according to plan to landing area, Advanced training theory exam, Gear check exam								
Advanced training								
18-20: Canopy handling	2000–4000 m	15-16: Kuvunkäsittely	2000–4000 m	Jumprun determination, group exits	Turns with rear risers, Observing loss of altitude during turns, Controlled crosswind landing	Safe group skydiving, Get to know disciplines	Packing and packing checks for student gear, Own gear	Instructions, laws, rules and regulations, Physiology, Organizing skydiving
21-25: Group skydive	3000–4000 m	17-21: Ryhmähyppy	3000–4000 m					
26-30: Free/optional	3000–4000 m	22-24: Valinnainen	3000–4000 m					
31: Check dive	situational	25: Koehyppy	tilanteen muk.					
5 Exit spot determinations, and landing within 50m from planned spot, A-licence theory exam, Packing and packing checks exam								

TRAINING PROGRAM – SL

	JUMP	ALTITUDE	FREEFALL	COMMENT (HD PILOT CHUTE IN BASIC TRAINING) 14.4.2021	
FJC: jump I dive flow, theory exam, Medical statement, Practical exercises → ELEMENTARY TRAINING STUDENT					
1	SL-jump	1000	---	RADIO: Exit, X-position, arch, count eye contact with the plane or instructor. Maintaining stable body position. Radio on 3 first jumps. EP exercise valid for 2 months. Canopy handling evaluation during every jump	ELEMENTARY TRAINING
2	SL-jump	1000	---		
3	SL-jump	1000	---		
t6b.2	*Practice pull*			PP theory + practices on the ground and in harness. Correct rhythm, ARCH-REACH-PULL.	
4	SL-PP-jump	1000	---	Stable body position, ARCH-REACH-PULL and back to basic body position. Maintaining arch and symmetrical arm movement. Last PP and SD during same or next calendar day.	
5	SL-PP-jump	1000	---		
6	SL-PP-jump	1000	---		
t3.5 t3.6 t6b.3	*Freefall, deployment, self deployment 3"*			Deploying self, basics of freefall, pilot chute in turbulence and packing for SD main canopy. **EMERGENCY EXIT CHANGES → TRAINING!** On top of lecture practical exercises on the ground and re-cap for EPs.	
7	Stable, count	1100	3	Similar than PP. Stable body position, ARCH-REACH-PULL. Tolerance 2–5°.	
8	Stable, count	1200	5	3x3-check. (*t2.6*), *t6b.4*. Stable position, count 101–102–ARCH-REACH-PULL. Tolerance 4–7°.	
9	Altimeter (count)	1600	10	*t3.5, t6b.5, t10.1*, 3x3-check and ***t10.8* Dangerous situations in freefall and TRAINING**. Deployment according to altimeter at 1300 m, count just in case. Stable, relaxed, basic body position and heading.	
RECURRENCY AFTER 30 DAYS: SL AND PP → SL; 3", 5" AND 10" → PP or other tasks given by instructor					
t3.6: Deployment, part HD, signature to logbook, t8b: SL-elementary training program, t9: exit, t10: Freefall basics (excluding front flip t10.4), t11: Weather, t12: Exit spot, t13: Safe canopy flight and accurate landing, t15b: SL-jumps; re-cap of dangerous situations and EP. **Student canopy packing** (throughout the program)**. Basic training written exam → BASIC TRAINING**					
10	Altimeter, spot. (HD-use practice)	1800	15	Deployment according to altimeter. Deployment signal, relax, body position and heading. Exit spot determination with instructor.	BASIC TRAINING
11	Floating exit, spot	1800	15	5 EXIT SPOT DETERMINATIONS WHERE LANDING WITH PRE-PLANNED PATTERN TO LANDING AREA +3 canopy handling exercises: Maintain stable body position after exit, spotting alone.	
12	Diving exit, spot	1800	15	Dive with heading control. Stable, relax, spotting alone.	
13	360° turn, spot	2400–4000	25–60	Controlled turn. Stop. Tolerance ± 90°. Spotting alone. Stop working at 1600 m	
14	Back fly, spot	2400–4000	25–60	Transition belly-back (4 s), recover and stable. Stop working 1800 m.	
15	Barrel roll and back flip, spot	3000–4000	40–60	Controlled barrel roll with heading control. Stabilize after. Tolerance ± 90°. Controlled flip, Heading control. Stabilize after. Tolerance ±90°. Stop working 1800m	
16	Track, spot	3000–4000	40–60	Long, straight, efficient, Heading and body control. Stop working at 1600 m.	
17	FS-track, spot	3000–4000	40–60	Break-off signal, 180°, track 4 s, stop, airspace check and deployment signal; repeat. Stop working at 1600 m.	
RECURRENCY AFTER 30 DAYS: 15" or other additional tasks required by instructor					
t14: Gear check, t16: Advanced training, t17: Canopy handling jumps, t18: FS, t19: Freefly, t20: Own gear, t28: Advanced training jumps; t9–t13: Re-cap; Dangerous situations and EP. **Gear check examination and written advanced training exam → Advanced training**					
18	Canopy handling	2000–4000	5	OWN GEAR WITH CI OR ACI PERMISSION, *t21* and canopy handling jumps; CAN BE WITHOUT INSTRUCTOR IN THE PLANE; 5 EXIT SPOT DETERMINATIONS, LANDING WITHIN 50M FROM PRE-DEFINED SPOT +3 CANOPY HANDLING EXCERCISES (*t17*): **Canopy handling** jumps are jumped according to the guide, jump number is put to the logbook. During canopy handling jumps there are no other exercises in freefall, if student uses own gear, these must be jumped in a row. If exit altitude higher than 2000m, deployment according to the program.	ADVANCED TRAINING
19	Canopy handling	2000–4000	5		
20	Canopy handling	2000–4000	5		
21	Group jump, spot	3000–4000	40–60	**First group skydive**. Learn body position. Altitude awareness, break-off (first 1800 m / when experience allows 1600 m) and track. *t18*. **Group skydives** choose from **FS-jump program** (freefly with requirements by the guide). like 1. group skydive (jump 18), but weight little bit on the performance, safety is priority. All 2-FS-jumps. Put number of a jump from the program to logbook.	
22	Group jump, spot	3000–4000	40–60		
23	Group jump, spot	3000–4000	40–60		
24	Group jump, spot	3000–4000	40–60		
25	Group jump, spot	3000–4000	40–60		
26	Free, spot	3000–4000	40–60	**Freefly jumps** advancing according to the guide. **FS:** Good body position, stay in place, hand signals, movement horizontally, up and down, turns, movement sideways, grips, fly slot, Break-off, track, deployment and safety. Focus in safety. **Break-off at first 1800 m, then at least 1600 m**. **Advance according to the FS-program** depending on skill level and previous jumps. Mark to logbook tasks done. **Safety is priority when evaluating (Altitude awareness, break-off, track)**, but partially also evaluate performance during freefall. Canopy handling jumps are jumped according to the guide, jump number is	
27	Free, spot	3000–4000	40–60		
28	Free, spot	3000–4000	40–60		
29	Free, spot	3000–4000	40–60		
30	Free, spot	3000–4000	40–60		
31	Check dive	**According to the situation**		Controlling entire skydive in practice; *t24* before jump. Keeping conditions in mind. With instructor assigned by CI, ACI or SO. Not passed if instructor has to intervene.	
RECURRENCY AFTER 30 DAYS: 15" or other additional tasks required by instructor					
t21: Gear checking and maintenance, t22: Packing checks for student canopy, t23: Rules, laws and regulations, t24: Organizing skydiving activities, t25: Special activities, t26: Physiology, t27: Risk factors, actions during accidents and first aid; t9–t14 and t17–t20: re-cap; dangerous situations and EPs (re-cap) **Packing and checking exam for student main canopy, written theory exam and jump count within 12months. → A-license requirements fulfilled (CI/ACI/instructor) → Logbook is training certificate → LICENCED SKYDIVER → A-LICENCE APPLICATION TO FINNISH AERONAUTICAL ASSOCIATION**					

TRAINING PROGRAM – AFF

	JUMP	ALTITUDE	FREEFALL	COMMENT 14.4.2021	
FJC: level I dive flow, theory exam, Medical statement, Practical exercises ➔ ELEMENTARY TRAINING STUDENT					
t6a: AFF jumps					
1	Level 1	3000–4000		RADIO *t10.1.* Exit, CoA, 3xPractice pull, Stable body position, Altitude awareness, Deployment 1600 m (±300 m). Radio at least on 3 first jumps. EP exercise valid for 2 months. Canopy handling evaluation during every jump.	ELEMENTARY TRAINING
2	Level 2	3000–4000		*t10.2.* PP until OK, Movement forward, 2x90° turn, Deployment at 1600 m (±300 m).	
3	Level 3	3000–4000		PP until OK, stable body position with heading control, own deployment. deployment at 1600 m (±150 m).	
4	Level 4	3000–4000		3x3-check (*t2.6*). One instructor. exit spot check, gear check from now on, 90° turns (±20°). Deployment 1500 m (±150 m).	
5	Level 5	3000–4000		Exit spot check, 360° turns (±45°), canopy handling. deployment 1500 (±150 m).	
6	Level 6	3000–4000		*t9.2.3 AND t10.5* ja *t10.6*. Exit spot check, floating exit alone, barrel roll, back flip. deployment 1400 m (±150 m).	
7	Level 7	3000–4000		*t9.3* and *t10.4*. Exit spot check, diving exit, front- and back flips, 2x360° turns. deployment 1400 m (±150 m).	
8	Level 8	1800–2500	15	***t10.8* and emergency exit changes ➔ TRAINING!** First low altitude, floating exit, stable body position, altitude awareness, Stable body position and deployment. Instructor is not in freefall, deployment 1400 m.	
Levels 1–3 jumped with two instructors. Levels 4–8 with one instructor. If level 3 is jumped as recurrency or after unsuccessful jump, it can be jumped with one instructor if safety is not compromised. RECURRENCY AFTER 30 days levels 2–3: previous level. Levels 4–7: previous level or level instructed by an instructor. Level 8 must be jumped within 14 days from level 7, or then recurrency for level 7. If break more than 3 months, recurrency is level 3.					
t8a: AFF Basic training program, t9: Exit, t10.3: Back fly, t10.7: Tracking and FS-tracking, t11: Weather, t12: Exit spot, t13: Safe canopy flight and accurate landing, t15a: AFF jumps; Re-cap for dangerous situations and EP. **Student canopy packing** (throughout the program). **Basic training written exam ➔ BASIC TRAINING**					
9	Stability altimeter, count, Spot	1600–1800	8	**5** EXIT SPOT DETERMINATIONS WHERE LANDING WITH PRE-PLANNED PATTERN TO LANDING AREA + 3 canopy handling exercises (*t13*)	BASIC TRAINING
10	Stability altimeter, count, Spot	1300–1500	5	Getting used to lower altitude. Things learned in AFF: Floating exit, stable body position, altitude awareness and stable freefall. Deployment at 1300m.	
11	Stability altimeter, count, Spot	1300–1500	5		
12	Back fly, Spot	2400–4000	25–60	Transition belly-back (4 s), return and stable body position. Stop working at 1800 m.	
13	Track, Spot	3000–4000	25–60	Long, straight, efficient, Heading and body control. Stop working at 1600 m.	
14	FS-track, Spot	3000–4000	40–60	Break-off signal, 180°, track 4 s, stop, airspace check and deployment signal; repeat. Stop working at 1600 m.	
RECURRENCY AFTER 30 DAYS: 15" or other additional tasks required by instructor					
t14: Gear check, t16: Advanced training, t17: Canopy handling jumps, t18: FS, t19: Freefly, t20: Own gear, t28: Advanced training jumps; t9–t13: Re-cap; Dangerous situations and EP. **Gear check examination and written advanced training exam ➔ Advanced training**					
15	Canopy handling	2000–4000	5	OWN GEAR WITH CI OR ACI PERMISSION, *t27* and canopy handling jumps CAN BE WITHOUT INSTRUCTOR IN THE PLANE **5** EXIT SPOT DETERMINATIONS, LANDING WITHIN 50M FROM PRE-DEFINED SPOT + 3 CANOPY HANDLING EXCERCISES (*t17*)	ADVANCED TRAINING
16	Canopy handling	2000–4000	5		
17	Canopy handling	2000–4000	5	**Canopy handling** jumps are jumped according to the guide, jump number is put to the logbook. During canopy handling jumps there are no other exercises in freefall, if student uses own gear, these must be jumped in a row. If exit altitude higher than 2000m, deployment according to the program.	
18	Group jump, spot	3000–4000	40–60	**First group skydive**. Learn body position. Altitude awareness, break-off (first 1800 m / when experience allows 1600 m) and track. *t18.*	
19	Group jump, spot	3000–4000	40–60	**Group skydives** choose from **FS-jump program** (freefly with requirements by the guide). like 1. group skydive (jump 18), but weight little bit on the performance, safety is priority. All 2-FS-jumps. Put number of a jump from the program to logbook.	
20	Group jump, spot	3000–4000	40–60		
21	Group jump, spot	3000–4000	40–60		
22	Group jump, spot	3000–4000	40–60		
23	Free, spot	3000–4000	40–60	**Freefly jumps** advancing according to the guide. **FS:** Good body position, stay in place, hand signals, movement horizontally, up and down, turns, movement sideways, grips, fly slot, Break-off, track, deployment and safety. Focus in safety. **Break-off at first 1800 m, then at least 1600 m. Advance according to the FS-program** depending on skill level and previous jumps. Mark to logbook tasks done. **Safety is priority when evaluating (Altitude awareness, break-off, track)**, but partially also evaluate performance during freefall.	
24	Free, spot	3000–4000	40–60		
25	Check dive	**According to the situation**		Controlling entire skydive in practice; *t24* before jump. Keeping conditions in mind. With instructor assigned by CI, ACI or SO. Not passed if instructor has to intervene.	
RECURRENCY AFTER 30 DAYS: 15" or other additional tasks required by instructor					
t21: Gear checking and maintenance, t22: Packing checks for student canopy, t23: Rules, laws and regulations, t24: Organizing skydiving activities, t25: Special activities, t26: Physiology, t27: Risk factors, actions during accidents and first aid; t9–t14 and t17–t20: re-cap; dangerous situations and EPs (re-cap)					
Packing and checking exam for student main canopy, written theory exam and jump count within 12months. ➔ A-license requirements fulfilled (CI/ACI/instructor) ➔ Logbook is training certificate ➔ LICENCED SKYDIVER ➔ A-LICENCE APPLICATION TO FINNISH AERONAUTICAL ASSOCIATION					

THINGS PRACTICED DURING STUDENT JUMPS

During student program there is practices for those theoretical knowledge and skills it requires to be an independent licensed skydiver.
Student, prepare to show your knowledge to the next instructor or coach you jump with!

Predictable and safe canopy flight

Weather

Exit spot and exit order

Choosing gear and checking it

Group jump safety

Freeflying safety

Rules and regulations

Organizing skydiving activities

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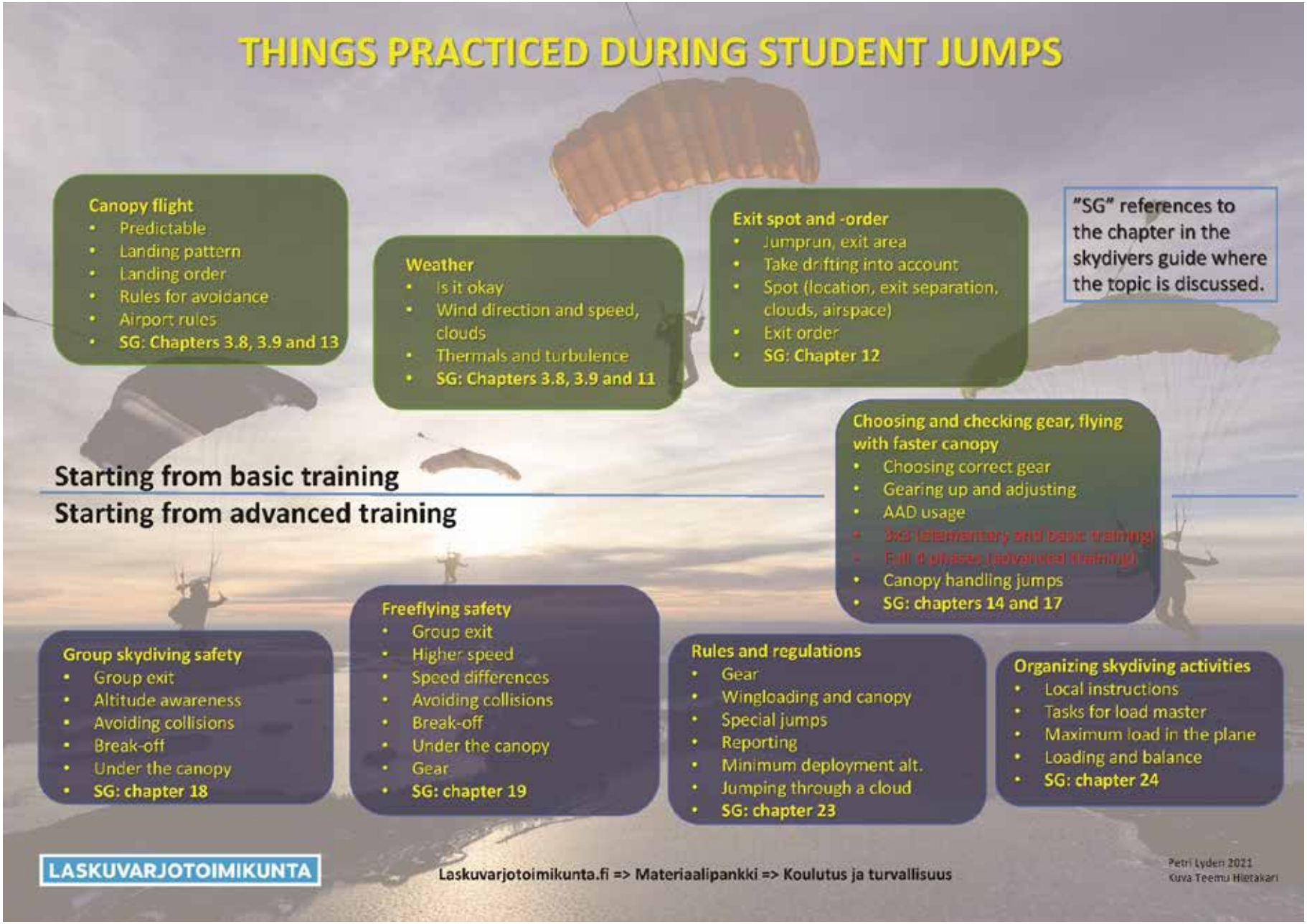
THINGS PRACTICED DURING STUDENT JUMPS
Canopy flight
• Predictable
• Landing pattern
• Landing order
• Rules for avoidance
• Airport rules
• SG: Chapters 3.8, 3.9 and 13
Weather
• Is it okay
• Wind direction and speed, clouds
• Thermals and turbulence
• SG: Chapters 3.8, 3.9 and 11
Exit spot and -order
• Jumprun, exit area
• Take drifting into account
• Spot (location, exit separation, clouds, airspace)
• Exit order
• SG: Chapter 12
"SG" references to the chapter in the skydivers guide where the topic is discussed.
Starting from basic training
Starting from advanced training
Choosing and checking gear, flying with faster canopy
• Choosing correct gear
• Gearing up and adjusting
• AAD usage
• 3xG (elementary and basic training)
• Full 6 phases (advanced training)
• Canopy handling jumps
• SG: chapters 14 and 17
Group skydiving safety
• Group exit
• Altitude awareness
• Avoiding collisions
• Break-off
• Under the canopy
• SG: chapter 18
Freeflying safety
• Group exit
• Higher speed
• Speed differences
• Avoiding collisions
• Break-off
• Under the canopy
• Gear
• SG: chapter 19
Rules and regulations
• Gear
• Wingloading and canopy
• Special jumps
• Reporting
• Minimum deployment alt.
• Jumping through a cloud
• SG: chapter 23
Organizing skydiving activities
• Local instructions
• Tasks for load master
• Maximum load in the plane
• Loading and balance
• SG: chapter 24
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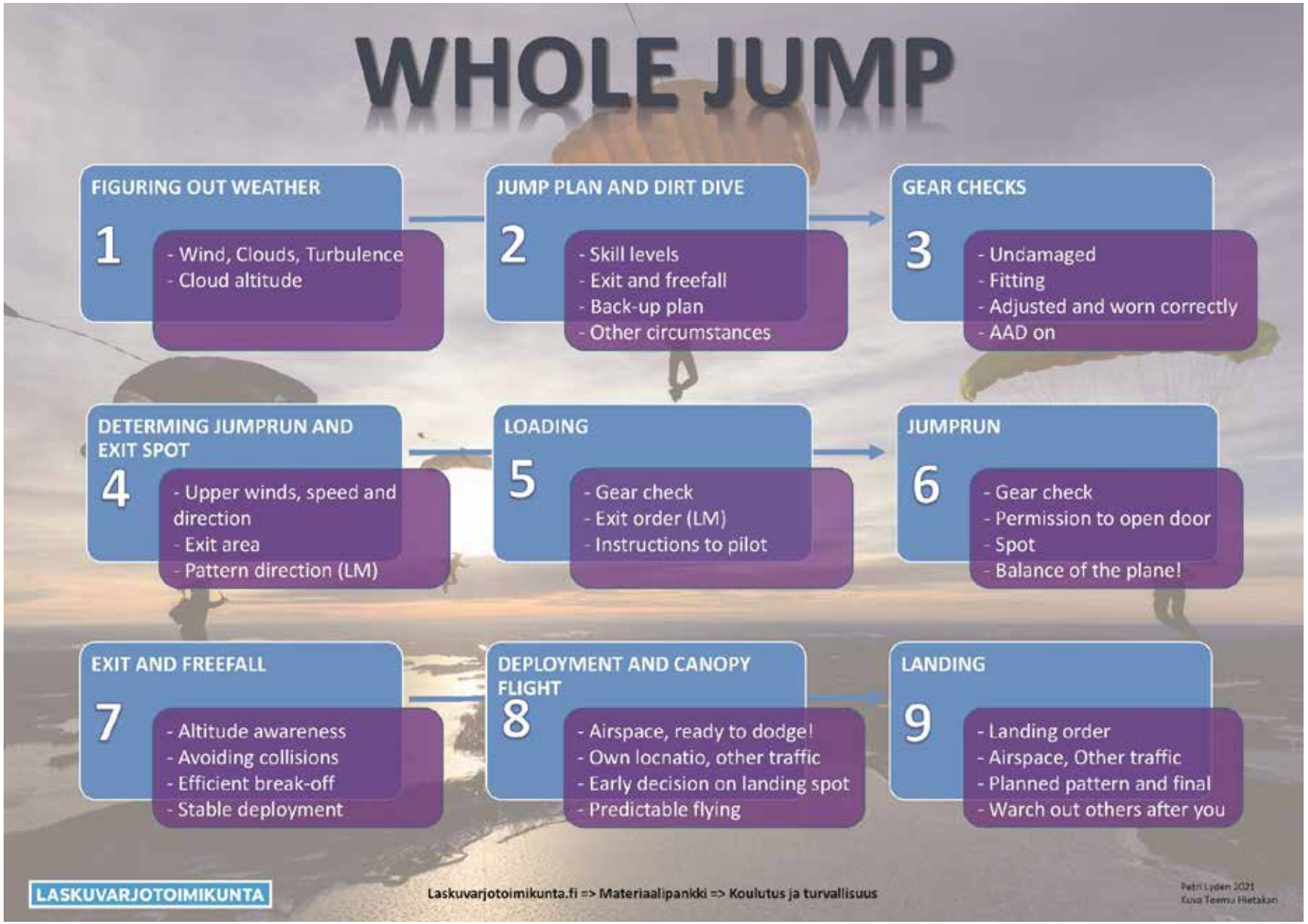
WHOLE JUMP
FIGURING OUT WEATHER
1
- Wind, Clouds, Turbulence
- Cloud altitude
JUMP PLAN AND DIRT DIVE
2
- Skill levels
- Exit and freefall
- Back-up plan
- Other circumstances
GEAR CHECKS
3
- Undamaged
- Fitting
- Adjusted and worn correctly
- AAD on
DETERMING JUMPRUN AND EXIT SPOT
4
- Upper winds, speed and direction
- Exit area
- Pattern direction (LM)
LOADING
5
- Gear check
- Exit order (LM)
- Instructions to pilot
JUMPRUN
6
- Gear check
- Permission to open door
- Spot
- Balance of the plane!
EXIT AND FREEFALL
7
- Altitude awareness
- Avoiding collisions
- Efficient break-off
- Stable deployment
DEPLOYMENT AND CANOPY FLIGHT
8
- Airspace, ready to dodge!
- Own locnatio, other traffic
- Early decision on landing spot
- Predictable flying
LANDING
9
- Landing order
- Airspace, Other traffic
- Planned pattern and final
- Warch out others after you
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Skydiving terminology

Block (FS)
FS-skydiving a part that is formed with two formations and a transition.

Box
Basic body position for freefall.

Booties
In FS-jumpsuit the part that is pulled over toes to provide extra surface tension and brings power to the legs.

Dive pool
International Skydiving Commission (ISC)
updates list of blocks and randoms for FS- and VFS-competitions.

Floater
In 4-way front- and back floater. In bigway floater leaves before the base.

FS
Formation Skydiving, also known as RW, relative work. Size of the formation is presented as for example: 2-way, 4-way. In competitions 4-, 8- and 16-way.

Grip
In FS-jumpsuits there are these parts where you can grab.

Intermediate
European competition category for beginners with smaller dive pool.

Dirt dive
Practices done before boarding the plane

Track
Movement after the break-off where skydivers gather as much horizontal separation as possible for deployment.

Formation
Skydivers linked together.

Open
Competition category where whole dive pool is in use.

Break-off
Releasing grips while moving from one formation to another.

Random
Predefined single formation.

Sequence
Formations, transitions and movement planned together.

Audible altimeter
Electronic device skydivers have in their helmet to give a signal at predefined altitudes, such as break-off and deployment.

NOTES