

the

TOP SECRET

endum

Contents:

Preface
page 5

Attitudes
page 9

Equipment
page 15

Manoeuvres
page 31

Appendix
page 57

**the acro compendium
revision 1 eng - 2004.dec.14.
copyright Pål Hammar Rognøy
published by HP/NLF
all photos by Pernilla Hammar Rognøy and Pål Hammar Rognøy
except:**

- **H&M advertisement, page 14,**
- **Illustration Ikaros, page 14**
- **Illustration reserve parachute, page 21**

Preface

Finally! The acro compendium is here.

This release symbolizes the end of the trial period of aerobatics with paraglider, acknowledging the discipline within our sport. The trial period begun in 2001 and was formally ended in 2003, but it is not until now that the task of the acro working group is fulfilled.

This compendium deals with a lot of what we have experienced during the trial period, but not all. As an acro pilot you are still obliged to use your own head and it does not make sense to believe that all answers will be found in this compendium. This is also why we have chosen to call it *the acro compendium* and not *the Bible of acro flying*. But who knows, one day we might write that one as well. Meanwhile you have all the information already written down in this compendium to absorb in peace and quiet. You might agree or disagree on many issues discussed, as long as it makes you analyse every single claim in detail, all the work with this compendium has definitely been worth it.

The acro compendium is written for the aerobatic pilot. This means that it is written for pilots holding a ParaPro 5 licence (hereafter called *advanced pilot*) with one, or more, SIV courses, with a versatile experience built up through a lot of flying over time, and with a great interest in acro paragliding. We are aware that quite a few pilots with lower experience than the above mentioned will read this compendium. Therefore we want to point out that this is not an acro user manual that in any way could compensate for lack of experience and knowledge. Even if one thoroughly reads this compendium, it does not give anyone the right to practice or even try manoeuvres which are defined as acro before one has the level of licence and the sufficient knowledge required. To prevent this is not only the responsibility of every pilot him- or herself, but also every single acro pilot. It is ok to be a tiny bit police man. It is part of the deal we made with the federation to make acro paragliding legal in Norway. We are supposed to look after each other.

The manoeuvres; spiral dive, wingovers and asymmetric spiral are in Norway defined as basic manoeuvres within acro paragliding. Our thought was that these three manoeuvres should be practiced into perfection before the time came to move on to more advanced manoeuvres. This is still our belief. These manoeuvres give a lot of experience on all three rotational movements of the glider (roll, pitch and yaw), an essential knowledge for an acro pilot. We hope, and demand, that every single acro pilot understands this and for this reason also practices a lot on these manoeuvres.

Every single acro pilot has his- or her own way. Some have practiced a lot and executes a lot of manoeuvres perfect; others are still beginners working with the basic manoeuvres. In our handbook, we have pinpointed the minimum height for aerobatics with paraglider, to 100 meters above the ground. It is extremely important to understand that this is not the level considered as safe height. 100 meters is normally just enough to throw the reserve if you react immediately to the situation. But it is in no way a guarantee. All flying with a paraglider is a risk assessment. When you are 100% sure of a manoeuvre, you might be able to go out of it as low as 100 meters above the ground, while other manoeuvres should never even be tempted if you are not above water whit the boat ready to pick you up.
Enjoy.)

Pål Hammar Rognøy
Head of the Norwegian Acro Working Group

Some milestones

- 1980-1990 The infancy of paragliding. All acro or aerobatics consisted mostly of playful soaring. Pilots practising spin- and stall manoeuvres were looked at as extreme or they worked as test pilots.
- 1990-1995 Some pilots thought that a paraglider could be looped, and a lot of more or less successful attempts were made.
- 1996-1998 Acro with paraglider reappeared as a competition format. The manoeuvres were still mainly spin, stall, deflations and shrimp. Some pilots had learned loop and helicopter.
- 1998 Norway: Stian Albertsen plans to be the first Norwegian to loop. Practises in silence and we still do not know if he was the first to make it.
- december 1999 Raul Rodriguez practises on a particular spin manoeuvre. When he changes glider he suddenly finds himself in a new situation. The glider is not in spin, but the pilot nevertheless rotates backwards. This manoeuvre is later named the SAT manoeuvre, after SafetyAcroTeam founded by Raul the year before.
- 1999-2000 The SAT manoeuvre were looked at like the most extreme and dangerous manoeuvre of them all and only a few pilots in the world mastered it. With it a new interest of acro paragliding begun. It was no longer only collapses and chaos, but rather beautiful and dynamic movements through the air.
- june 2000 Peter Brinkeby (Swedish competition pilot) stunned 100 participant pilots at the Nordic Championships when he performs 120 degrees wingovers in front of the take-off, top lands to a enormous jubilation and applause. He quietly approaches Per Arne and tells him that his glider might be a bit loose on the wingtips.
- 2000-2001 The world has suddenly understood that the SAT manoeuvre is not that dangerous after all. New manoeuvres like dynamic SAT and the tumble based on SAT are invented.
- autumn 2000 After some discussions HP/NLF (the Norwegian federation) allow all PP4 and PP5 pilots who ask for it dispensation to fly acro in Norway. 23 pilots got their dispensation until the 1st of March 2002.
- april 2001 Rolf Dale reports home from Israel that he has learned how to do a loop. We also get to know that the correct name of the manoeuvre is "Reversal".
- july 2001 Paal Wiik, as the first Norwegian ever, performs the SAT manoeuvre above the landing in Piedrahita. It would take him two new years before he was able to perform it again.
01. march 2002 A general dispensation is given to all PP5 pilots in Norway. Pilots with the PP4 licence, who had the dispensation from before, now lost it. This gave a hint that the final requirement would be PP5.
- 2002-2003 Flying acro with a paraglider is here to stay. Numerous courses are given in acro all over Europe.
- 2003 An unofficial Acro World Cup is arranged.
- june 2003 Peter Brinkeby (Swedish competition pilot) holds an acro course to Norwegians during the Extreme Sports Week in Voss. He also participates as a judge during the competition Vertigo Voss.
- june 2003 The unofficial Acro World Cup hits off the season with Vertigo Voss where the participants take off method is to drop from a helicopter.
- 2003 Ole Jørgen Løvland, Stein Egil Mangseth, Ronny Olsen and Pål Hammar Rognøy travels to Central Europe to participate in several of the unofficial World Cup competitions.

Some more info on the trial period

It was not until 2001 that acro hit it off in Norway. Until then acro was synonymous with loop/reversal and connected with great danger to fall into the glider. This is why we had a prohibition on all pendulums greater than 90 degrees. This itself was pretty huge since the limit just a couple of years earlier had been 45 degrees in pitch and 60 degrees in roll. But since these limits often were exceeded during the SIV courses, the rules had to be changed.

During the autumn of 2000 a discussion took place on the Internet forum SkyForum. Was it really any point in the prohibition against 90 degree plus pendulums? We had seen pilots in central Europe easily realize 120 degree wingovers without any tendency whatsoever to fall into the glider. Why should not Norwegian pilots be able to pull off the same?

All credit to our federation who really jumped on the train quickly, and in co work with the safety committee it was decided that a trial period should be granted as soon as possible.

All pilots, holding minimum a PP4 license, who were interested in the project could apply for dispensation to fly acro in Norway. The dispensation would last until the 28th of February 2002. The project was to be lead by former team pilot Stein Egil Mangseth and at the end of the project a report should be handed in to HP/NLF who again would evaluate the future of acro in Norway.

It would show itself that the trial period was to be larger than expected and an acro committee was appointed to continue the work Stein Egil had started. The acro committee, directed by Pål Hammar Rognøy, Tor-Erik Stranna and Rolf Dale, handed in a report at the end of the trial period. The report was almost without exemption positive. The goal was not only to open up for acro paragliding, but to get the acro to be done under controlled conditions. The committee wanted an open dialogue between acro pilots where training and attitude would be central, but most important of all was the work with creating understanding and respect to the fact that acro requires practice, practice and then again practice.

When the trial period ended the dispensation was altered into a general dispensation to all PP5 pilots. Those pilots who held the PP4 licence with dispensation now lost it. This was one of the points the acro committee had presented and in 2003 the final alternation was put into the national set of rules.

Those of us, who are the most involved in this work, have in no way spent our time in front of the computer making up the rules. Most of the time we have been out flying. Practiced, practiced and yet again practiced. And most of all we worked on nailing the SAT'an SAT manoeuvre (read frustration). One of our most important tools to get there was the logbook on internet. Every attempt on the SAT was thoroughly and exact described in order to let others understand what we had done and then bring this knowledge with them when they were out there trying it themselves.

Since our attempts were thoroughly described in the logbook on Internet, everyone who so wished could take part of our mistakes and successes. And not everybody was thrilled by the reading. On the Internet forum SkyForum a big discussion took place where pilots discussed the dangerous new style of flying and some of the most active acro pilots were regarded as totally crazy. There were also discussions around who would be the first pilot to get himself killed.

This somewhat worrying discussion clearly showed that there was still a lot of work to be done. Not everybody agreed with our philosophy of frankness where we described the manoeuvres we had learned in forums and the log book on Internet. A lot of people predicted acro to be the fall of paragliding in Norway. They foresaw accidents in great numbers. Why could not people understand that even though you allow acro, you do not necessarily have to run up on the closest hill, fly out and kill yourself?

The fact that the most dangerous and spectacular manoeuvres demanded practise, practise and yet again practise, would show out to be self explained. There were no accidents in great numbers, and the ones among us who had practiced the most worked extra hard to let other acro apprentices to understand that you first have to master the first manoeuvre before you move on to the next one.

This is why we in Norway have defined 3 basic acro manoeuvres: spiral dive, wingovers and asymmetric spiral. If one does not master these, one shall not move on to more advanced manoeuvres.

Most pilots think they master the spiral dive when they have learned quick entries and have achieved a larger sink than their friend. WRONG! To steer the glider throughout the entire spiral is the most important thing, from entry to exit. Avoiding a gigantic pendulum in the exit or a locked spiral. At no matter what time one shall be able to steer out of the spiral, no matter how large the sink is.

The wingovers have to be smooth and high. They shall not have deflations on neither inside or outside. And do not believe they are high before you have seen yourself. When you believe yourself to be way over the rear, the movie afterwards will often show that you are tops on the level of the wingtip. Ooops.

Is it now necessary to explain that you have to practise some more before you move on to SAT, helicopter, mcTwist, reversal, twister, tumble, dynamic SAT, mistyflip and so on.

Through the work we have accomplished in Norway since the beginning of the trial period, we have succeeded very well in implementing the thought of perfection before moving on. We have managed to restrain the freshmen of acro, and made them concentrate on perfection of the manoeuvres they know. At the same time as the more experienced pilots have received support and help to learn more and new manoeuvres. There are nevertheless some souls out there who still do not approve of acro. And only these few are enough to bring down the entire acro-Norway. This is why it is so important to keep working on attitudes and behaviour.

Attitudes

This chapter treats attitude creating work and how to make the world around us to better understand what acro paragliding is all about.

Throughout the paragliding educational system, there is one thing that keeps coming back – our attitude towards our own and our fellow pilots' safety. We call it AIRMANSHIP.

When we move over to acro with paraglider this word becomes even more important.

In most FAI countries, flying acro with paraglider has been implemented in the national rules of paragliding, clarifying the pilot level which has to be obtained before moving on to so called extreme manoeuvres. The level of certificate chosen in Norway is the highest rate possible to obtain – ParaPro5 – from now on referred to as Advanced Pilot.

But let us go back to the issue of safety and attitude. At the level of Advanced Pilot, you shall already have proven your ability to take care of your own security. You are equally supposed to be skilled enough not to put pilots around you in danger by performing advanced manoeuvres in their safety zone. But, as an acro pilot this responsibility stretches a bit further. You have to take in consideration the pilots following your activities from a distance and even from the ground. What kind of ideas might pop up in their heads while watching you? Does this sound awkward? That you as a pilot suddenly have to take responsibility for other people's thoughts and actions? Well, this is a consideration all acro pilots have to bear in mind.



The surroundings

How are we supposed to make people understand that even though you fly acro, you don't have to be a complete idiot who doesn't take your life seriously?

Well, it's not always too easy. This is an issue the BASE-jumpers struggled with for a long time in their early career. Most likely they are still struggling. Even among their fellow parachutists and from their own federation, they met such a hard resistance that they had to organize their very own federation – the xxxxxx.

Luckily this seems to be something us paragliding pilots in Norway do not have to face. Our own federation has rather implemented acro from the beginning with large enthusiasm, proclaiming that this is something they want to be a considerable part of from the very first step. With this confidence given, it is up to us as pilots to make sure that this new branch within paragliding is performed under well structured forms and to help each other to spread awareness of attitudes in order to avoid accidents.

With the consent of the Norwegian federation, we are well on the road towards not being considered as suicidal idiots.

So what about the rest?

It will have to be each and every pilot's own responsibility to handle this problem, but rule number one has to be proper behaviour and to follow the rules and the recommendations given by the Norwegian Federation. Especially important is this when it comes to minimum height and safe distance to the terrain. These are things spectators and other pilots may react to. It may on many occasions seem silly to "hold back" just because there are other people watching, but this is where you have to evaluate your spectators. It may be smart to talk to the people present and explain to them what you are up to. It is important to explain that what you in fact are doing is well planned practise in order to achieve a specific goal, and not just something you do to show off. By doing this, the spectators and fellow pilots may be able to understand that there is in fact seriousness in the way you handle your glider. Your own goal with your practice is up to you.



What kind of thoughts and attitudes do these guys have around acro paragliding?

Is it dangerous?

So how can we make fellow pilots understand that this can be dangerous and that the requirements to be an Advanced Pilot is reasonable?

First you use a great lot of time and effort to explain that you are in total control of your manoeuvres, and that it is not dangerous. At the next moment you try to prevent less experienced pilots from doing the same manoeuvres just *because* of the great dangers with this kind of flying. Self-contradictory?

Maybe not. If you have made it clear that this neck-breaking way of performing the art of flying they just witnessed is a part of a well structured practice schedule, they will most likely understand that this way of flying demands exactly that. Practice and yet again practice. And the most important thing of all: a knowledge bank you can only achieve by a lot of so called normal varied flying before you pick up acro.

Secrecy and suppression.

Some people mean the only way to prevent fresh pilots from injuring themselves while flying acro, is to pretend like acro does not exist. You should at least not give instruction on how to perform the different manoeuvres or talk about how much fun it is. If this is the right way to prevent accidents from happening, this compendium is a huge mistake. We want to argue the opposite case. Information to as many as possible is our motto. By giving information and teach the art of action, we believe we will get more safe pilots and less accidents. So far acro has reasonable statistics. It gives us a hint that our way of thinking might be the right one. But if this is so, this attitude must also be taught to the pilots we tutor. It is important to understand that one shall not just hand out technical information about the way to perform the different manoeuvres, and then lean back satisfied. If you do this you have failed to understand what we mean by information to the larger crowd. Follow up each and every pilot. Give them tips and tricks on how to perform the easier manoeuvres they have to master before they move on to the manoeuvre they might have asked you about. Explain the dangers that lies within the manoeuvre and tell them how to deal with the problems that might occur if they do not perform it correctly. Create an understanding of, and interest for, practicing the basic manoeuvres into perfection before moving on to more advanced manoeuvres.

Example:

A newbie acro pilot wants to know how to perform a SAT. Answer as well as you can to the question, but continue to explain how to perform a spin and a spiral, and underline the importance to know these manoeuvres before the pilot moves on to practicing SAT. Also make sure to tell the pilot that these manoeuvres are like the ones on a SIV course and that they should be performed over water with a rescueboat. To inform about the Advanced Pilot requirement is a matter of course.

THE **TOP SECRET** COMPENDIUM

Yourself.

What about your attitude towards your own safety?

If you have managed to pass on and create right attitudes among others when it comes to acro, it might be time to evaluate yourself. Do you agree with your own explanations? If not, it is not likely the others agreed with you either. How come you do not convince yourself? Maybe you, like many other acro pilots, is a talent who masters the glider easily and nail most manoeuvres on your first try. Well, this is not the norm for everyone. And neither is it for you every single time. The syndrome of Icaros is something we are taught to be typical of PP3. This is when you are good enough to execute everything you try, but you are not experienced enough to understand the dangers that lies within. When it comes to acro, the syndrome of Icaros returns. This time among so called experienced Advanced Pilots. It might be that you have always had the syndrome. If this is your case, sit down and give your flying a thought. You have tried to teach others to go easy and practice a lot on easier manoeuvres before they move on, while you think of yourself like some kind of superman, able to jump on to new manoeuvres in the same second as they are discovered. Well, try to remember that what you have tried to teach others, also goes for you. Water, boat and plenty of altitude is your very best friend, so be your last name Kent or Rodriguez. And give yourself the credit to believe what you have taught others to believe.



Ikaros gets reckless and flies towards the sun.



You find the costume cheap at H&M, but does it really suit you?

Accidents

What to do once faced to an accident?

Besides treating the injured you also have to think of what happens around you and in the media. Just before Christmas in 2003, a paragliding pilot crashed into a large, partly frozen, water fall in Setesdalen, Norway. He was stuck there for two hours before the rescuers reached him. The whole rescue was filmed and within 24 hours it had been broadcasted on most TV-channels in Norway, on EuroNews and many other national news shows. The report did not contain any real bad publicity for paragliding, besides one person getting injured. But when news about incidents are spread so fast, it is hard to control what kind of attitudes and facts that are spread. If contacted by media in relation to an accident, one should most preferably give no comments. You can talk about paragliding in general, but avoid speculation about the reasons to why the accident occurred.

On the other hand, you should not trivialize the situation. It is easy to do, in an attempt to convince people that paragliding is not a dangerous sport. This might, unfortunately, work against its purpose. When you try to sweep off an accident, it might seem like it is a harsh sport where we do not care about our fellow pilots. It might also look like accidents are something we are so used to that we do not bother to care anymore. So, please, do not give any comments unless you are appointed this specific task.

So what about the assertion – information to the general public?

It is not our meaning to suppress anything. But there is not much point in handing out information if you have no substantial information to give. When it is time to hand out the information it should consist in facts and facts alone. Make sure that they who need the information get it first. Then the public can get what they need.

“Håndboka” clearly states how to handle, and who’s supposed to give comments, in case of an accident.

Chapter 11, Flytrygging in Håndboka.

Appendix 4

Extracted from Håndboka NHB-E rev4. June03

11.7.4. Information to press and general public

It is important that press and the general public are made aware of the work already in progress by the accident commission. Information shall be given by the commission or HP/NLF’s operative leader group.

The accident commission shall under no circumstances release personal data of the persons involved. When the influx of the press is strong, refer to their own “be careful placard”.

Otherwise look into “Recommended cause of action in case of accident”.

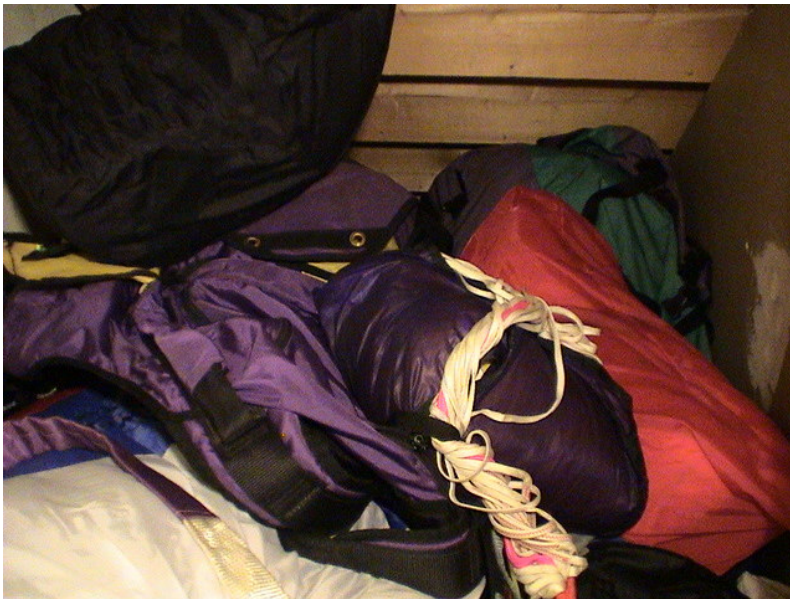
Equipment

This chapter deals with choices of: helmet, harness, reserve, glider, clothes and other stash.

In general

To be able to fly acro with a paraglider, of course you need a glider. Equally basic is a harness, a helmet and a reserve. But which ones to choose?

Generally, most equipment will work, but when you are faced to a variety of equipment specially designed for acro, the choice might be harder. But it is not advised to haste away and buy everything made especially for acro. A lot of the equipment made for acro, does not work so well to regular distance flying, but a lot of the regular equipment works very well for acro. This is where you have to weigh pros and cons, think things over thoroughly, and find out what you really need.



Some things to choose between.

Helmet

To fly acro with a paraglider, a normal, modern paragliding helmet will serve its purpose. There is however some things one should bear in mind when it comes to choosing a helmet.

Weight. There are a lot of forces interacting on your neck while flying acro, and every single gram extra makes an even larger impact when the g-forces are at their highest.

Vision. When it comes to flying a paraglider, the larger the field of vision, the better. In acro this is even more so. When you are working your glider at its worst, your eyes are moving rapidly between glider, ground and your partner if you are flying syncro. These are movements you should be able to do without having to turn your head too much, since this can influence the execution of the manoeuvres.

Type of helmet. There are two main types of paragliding helmets. Full or half. There are many arguments on why to use a half helmet when flying acro. In addition to weight and vision, one more factor comes into count when you participate in competitions – air.

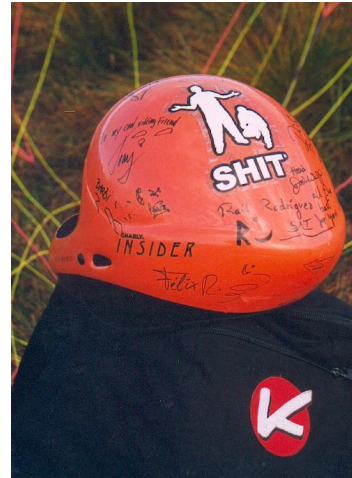
If you go into water, it might be necessary to receive air from divers, and if you wear a full helmet then, you are in trouble.

Tail. Modern paragliding helmets often have a large tail in order to reduce drag. This means nothing to an acro pilot, and the pros with a tail are much less than the cons. The tail can limit the pilot's ability to look up into the glider. While flying, and later on the ground drying your glider after a rough water landing, a tail can cause great distress.

Visor. The need of a visor is tiny when you fly acro. Make sure that nothing sticks out in order to avoid lines to hook onto unnecessary gadgets. Scary business.

Protection. Helloooo? What else to use a helmet for if it is not for protection. We are mostly exposed to strokes towards the back and the side of our heads. Make sure your helmet protects these areas satisfactory. A helmet with the label EN966 have gone through special tests for paragliding.

If you are to choose a helmet for acro of these criterion, a ski jumpers helmet, marked and certified according to EN966, should be the perfect choice. Maybe a dull choice, but the final choice is luckily up to you.



A worn out helmet filled with good memories of good friends.



The perfect choice?

Harness

Most harnesses can be used to fly acro, but if you choose one more suitable to the action, your work will be much easier. The keyword here is *weight shifting*.

In order to find a harness easy to weight shift, there are multiple constructional details to look for:

- Attachment points
- Distance between karabiners
- Cross bracing

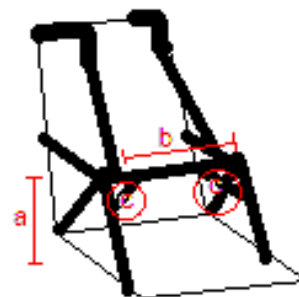
To achieve maximum weight shift you need lowest possible hang point, largest possible distance between karabiners and as little cross bracing as possible. Quite a few modern harnesses have leg straps from seat board up to the karabiners and chest strap. This type of leg straps works as a great cross and stiffens up the harness. Luckily you can adjust this by loosening up the leg straps. The advantage with this kind of system is that it rarely has supplementary cross bracing, hence the level of weight shift is totally adjustable.

Pay attention to the fact that most is not always the best. Do not loosen up all adjustments uncritically in order to achieve most possible weight shift. Turbulent air might turn into a true nightmare if your harness is too loose. And a harness too soft might also make it harder to counter a turn if you have a deflation, or make it hard to stop the glider from entering a spiral dive after a cravatte.

Back protection. The thicker the better is the general rule, but you rarely see acro pilots with regular airbags.

In some competitions you are advised not to use back protection because of the floating effect that might, in a water landing, turn your face into the water with a great risk of drowning. Nevertheless, experiences show that this has not been a great problem as long as the boat is attentive and react quickly. The back protection has also shown to give important protection when landing in water.

A clue when landing in water is to try to be seated in the harness until the boat reaches you, instead of tipping over and try to swim.



a. Placing of the attachment points
b. Distance between karabiners
c. Cross bracing



Harness with adjustable cross bracing through the leg straps.

Conclusion: Choose a harness that is not only loose on weight shifting, but also has many possibilities of adjustments. This way you will have an all round harness that can also be used for regular flying. The placement of the reserve parachute is a matter of taste, but make sure to be able to reach the handle in every given situation. The reserve should also be easy to take out and put in, since competitive flying means a lot of drying and repacks.

Choose a type of back protection that you are comfortable with, and with most possible alleviation. Newer back protectors have almost as good dampening abilities as a traditional airbag.

Rescue system

In all acro flying a reserve parachute shall be used. A standard modern reserve will serve its purpose, but if you want that little extra, there are a lot to choose between. Just make sure you are within the weight limit.

A few acro pilots use two reserves, placed in different places of the harness. Some have one on each side, others have one under the seat and the other behind the neck. The reason to why some pilots choose to fly with two reserves is obvious, but the necessity can be discussed.

Position. Where should the reserve be positioned to ensure best possible safety? There are many options, varying between harness model and brand.

On the back – the most common a couple of years ago. The drawback with this is that the handle might be difficult to reach or that the distance between handle and rescue is too wide, which might make a clean throw difficult.

On the side – this solution made the problem described above diminish. A handle easy to reach, minimal distance between handle and rescue. The disadvantage with this system is the weight difference between right and left side, and in acro this can be terribly disturbing.

Front mounted – was supposed to be the solution to the problems above. And maybe it is. This system is supposed to enable a throw in all directions. But many bad solutions are present at the market, especially when you want to put your harness on or take it off; extra strings, zippers etc.

Behind the neck – a solution supposed to solve the same problems as a front mounted reserve. But there have been problems during influence of strong g-forces where the high position of the handle is very hard to reach, and if you use a life jacket the handle can be impossible to reach.

Under the seat – a solution more and more common. It can be regarded as a compromise. Reminds a lot of regular back mounted, but the distance between handle and reserve is much shorter. The disadvantage is that the reserve easily gets moist and that there is no protection where the reserve is placed.



Double cap rescue system with a middle line from Charly Produkte Rev II



Rescue mounted under the seat. .

Repack should be done at least once a year. Normally you deliver your harness with the reserve to someone skilled enough to repack it. It might however be smart to familiarize yourself with the packing method and, maybe the most important part, how to mount it. This way you can get the quality insurance needed, and look through your own equipment to make sure everything works as it should. When you attend a rescue parachute packing course, it is common that 10% of the rescue systems do not function satisfactorily before they are repacked and mounted. If you have acquainted yourself with the rescue system, you have a fair chance to avoid being among the 10%.



Soon done packing..

Glider

Your choice of glider might be the hardest choice. Or the easiest. This is the part of the equipment we take most notice of and might all ready have made an opinion of. Often, one has already decided on what to use long before the glider has even been flown. Then it is good to know that most gliders on the market are good. And most gliders can also be used for acro.

To see if a glider is good or not for acro purely on its design, is hard.

There are two simple rules: the more weight you load your glider with, the faster it reacts and the lower certified it is the more dampened it is.

With these two rules in mind, one should buy an extra small high performance glider without certification to obtain the best acro glider. This might very well be true in theory, but you have also thrown all security over board.

Classification. Paragliders are designed to fit into different categories in order to enable pilots within a large range of experience to pick out the glider most suited to their experience and ambitions. The categorisation of the glider is based on their passive safety and their ability to damp out the situations without pilot effort. Unfortunately the safest gliders have the poorest performance. The difference between the categories has decreased though.

Student glider (DHV1) is generally too damped to work as an acro glider. You can perform nice simpler manoeuvres, but the energy in the exit is not enough to be able to use it to something useful and the transition to other manoeuvres might be tricky.

Standard glider (DHV1/2) might work very well for acro aspirants, but here the difference is large between the different models and their acro abilities. Good to use when you want to get to know some of the manoeuvres, but there is still a lack of energy leaving the manoeuvres which does not makes this kind of glider suitable to competitive flying.

Performance glider (DHV2) This is where we find the models mostly used for acro flying. They are still friendly enough (for an Advanced Pilot) when things go wrong, but it has enough speed and energy to enable nice flow in a program.

High end performance, or competition, glider (DHV2/3) often gives you this little extra you do not get from the category beneath it. Shorter steering range and a bit more speed and energy when performing the manoeuvres. It might

however be a bit too much to handle, and pure cross country machines might have slightly slower handling.

Competition glider (DHV3-comp) might be a pure energy machine which gives you a very nice flow throughout the program. If you manage to keep your glider open. The somewhat slower handling is compensated by more speed and energy, and manoeuvres that are supposed to be executed with a lot of altitude are never made higher than with these gliders. Within this category there are many models not suitable to acro at all, while some are fabulous if you are pilot enough to manage the instability that comes with a glider in this category. Make special attention to the fact that many competition gliders have very thin lines in order to squeeze as much performance as possible out of the glider. This is one of the reasons to why some of these gliders simply do not handle the forces implemented in flying acro, and there has been numerous occasions when lines have broken while flying. This can be unforgivable.

Competition lines (thin microlines) does not belong in an acro glider unless you are obsessed with protecting your lines and have the means to exchange them often. At least make sure the microlines you use have the same strength as if you would have ordered original sheathed lines for the glider. Competition gliders with thin lines do not deserve an unworthy retirement as an acro glider. For this the impacts are too large, and one can expect the fatigue on the lines to have been large already before. This is also true for gliders with ordinary lines, but cross country gliders are often exposed to longer flights and big climatic differences. The fact stands that competition lines are more sensitive to sun, dust and friction than regular sheathed ones.

While working with this compendium, we contacted Bruce Goldsmith, designer of Airwave Gliders, and asked him about his opinion on microlines on acro glider and our claim on this:

As far as microlines go I disagree. I think it is important to have strength in the lines so the strongest is to use microlines and make them as thick as normal lines, this gives about 30% greater strength than normal sheathed lines of the same diameter. Of course microlines designed for competition are completely unsuitable! I am talking about microlines designed for Acro.

*Hope this helps.
Bruce*

As you see, he agrees on the part where thin microlines do not belong to an acro glider, but he also puts forward the

alternative with extra thick microlines. But nevertheless, remember that the wear and tear of this kind of lines will be larger than on ordinary sheathed lines.

Weight range. The more forgiving glider you have, the heavier you have to load it in order to compensate for the lack of energy. If you fly with low weight in a forgiving glider it can get you into dangerous situations with discharge in manoeuvres where your body moves above the glider. This is an effect of lack of energy.

To be overloaded in a glider is not paradise either. Whenever you move outside the gliders certified weight range, the certification is no longer valid. This is not a thing that happens purely in theory. It is a fact that the behaviour of the glider is more violent if it is heavily loaded and that other problems occur if we fly under weight, these can be less energy and more frequent deflations.

Conclusion: If you want to fly a lot of acro you should go for a glider which enables you to get as much energy out of it without exceed the weight range of the glider. Normally this means you have to go for a DHV2 or DHV2-3. Even with these gliders, you should be in the upper part of the weight range to be able to squeeze out whatever extra you can that enables you to get a nice flow and a lot of energy between the manoeuvres. But if you overload the glider you have to be prepared to handle the alternation of the gliders behaviour.

When you begin with serious competition, this is unfortunately not enough. To be five or ten kilos over maximum weight is more common than not, and often this is actually what is needed in order to be able to perform the manoeuvres and the combination of manoeuvres you need to be able to do to even have a chance to win. If you want to overload your glider, you need a written permit from the manufacturer or the importer, consenting to you flying this glider with this overload.

Damage. We have not yet seen the long-term influence of acro flying on our equipment. What we do know is that the g-forces at times are multifolded compared to ordinary flying. And there has been damage to equipment while flying acro. As expected, it is the glider that faces the larger part of the problems, and it is the lines that have given in on the occasions we know of.

Some have tried to put down a number of hours a glider should endure of flying acro. This is an almost impossible calculation since all gliders are loaded with different load and every single manoeuvre loads the glider on different spots. The most damaging manoeuvre so far, seems to be the Tumble where there have been measured g-forces as high as 8 times larger as normal. Every single pilot also has his way of performing the manoeuvres and you do not lie in continuing tumbles when you fly acro. To tell you that a glider is made for 50 hours of acro, is a bit harsh. If you do not know how often you tumble or take SATs per hour, it is not possible to estimate the use per hour. The difference between different gliders and how much they can take, varies also a great deal. There have been incidents where extra reinforced acro gliders have torn A-lines already on one of the first flights.

We have also seen many occasions of stretched risers. This might for a paragliding pilot be a totally unreal situation. But it also shows what kind of forces our equipment is exposed to during acro. If the risers have stretched, the easiest way to see it is if you compare the lengths of respectively A-, B-, C- and D-risers on a regular flight. As much as 1.5 centimetres difference between A- and C-risers have been measured. We do not know as of today if this influences the rupture strength, but there is ongoing research.

The conclusion is that you shall be extremely cautious with your gear and especially aware of damages to A-lines. A tear of A-lines in the upper cascade might lead to a complete detach of all A-lines as a result of the extra tension when the first one goes.

If you fly a lot of acro, the safest thing to do is to exchange glider at least once a year.

Clothing

Are there clothes better suited for acro than others?

Not really. In acro we use the same clothes as we do for our regular flights, but all tiny details that might affect your safety get a larger importance. Hooks and buttons the lines risk to hook into, are when flying acro a slightly larger danger than normally.

Shoes with quick lacing should if possible be exchanged. Or it might be simpler to cover up the hooks with tape or something else when you fly. It is after all not too easy to find a pair of solid shoes well suited for paragliding without quick lacing.

Nevertheless, the shoes need good ankle support, but this is something most paragliding pilots already know all about.

The gloves might be even more important. Quite a few gloves are sold with tiny quick hooks meant to enable you to hook them onto your clothes. These hooks have an irritating tendency to hook into the break lines when you wrap up and out the brakes between manoeuvres. Long tightening cords with a locking mechanism has a very annoying tendency to squeeze itself in between lines and other things – to large irritation and possible danger. With this in mind: make sure to tuck all these extra cords away, and take away all hooks and cords you do not use.

One other thing to think of is to buy gloves with some upholstery for protection when you wrap the brake lines. Some manoeuvres demand both one and two wraps and when the brake pressure gets high the pain in your hands might be pretty bad if you do not have the right thing on your hands.

When you fly on a summer day, the thick snowboard gloves might be to hot. A tip is to take out the lining if possible, and replace it with some well upholstered bike- or weight lift gloves. No matter what kind of gloves you choose: never fly acro without them.



Solid and stable boot with potential dangerous hooks which should be taped.



Watch out for the strings.

Jacket and trousers. Use whatever you find comfortable. In acro, as in normal flying, ski- and snowboard outfits are most dominant. When choosing gloves, you have to watch out for hooks and buttons dangling dangerously. When you have closed a zipper, you should hide it as well.

Make sure you have enough clothes to keep you warm. To fly acro when you are cold is a true nightmare, but luckily acro is mostly about a short action flight, and the risk of freezing in the air is for this reason small. At takeoff, on the other hand, it is as on any other paragliding competition, waiting and more waiting.

A small hint is to buy easily removable clothes with good ventilation. Hip to ankle zippers in the pants are a luxury you are quickly addicted to.

Safety vest is obligatory for an acro pilot. All organized practice and all competitions take place over water. Safety vest is not obligatory, but strongly recommended. Make sure to invest in one that does not influence your movements while flying.

Safety vests made for kayaking are especially designed for a good range of movement, and are for this reason well suited for acro.

Self inflated safety vests are also good, but make sure what activates them. Some are inflated upon contact with water, others are inflated when you pull a string. If you choose a self inflated kind, you should always bring extra pressure bottles. In a competition you have to take into calculation that the safety vest might come to use multiple times a day, and the consumption of bottles might be considerable.

PS. Both kinds of inflatable safety vests have a safety splint which has to be removed before use.

Swimsuit might be to push it a bit too far, but when you fly competitive acro, you will have to count on taking a swim once or twice. So do bring some extra clothes to wear while you wait for the others to dry.



This pilot needs at least one dry shift of clothes.

Other must-haves.

So what other equipment should a true acro pilot have.

Well. Most preferably is to avoid all lardy-dardy attached to the harness when you fly acro. This means that all instruments should be removed. Some things might nevertheless come in handy. Below follows some suggestions you might want to invest some money in:

Smoke cans. All aerobatic manoeuvres give a better visual impression when you have a tail of smoke following your moves. It shows how your body has moved in comparison to the glider. Paragliders are and will be the mopeds of the air, but with a string of smoke, one can really accentuate the mopeds potential in the air.

Mount the smoke can low, behind the pilot. The smoke contains a colouring powder which stains the equipment heavily when exposed to it. If you inhale the smoke, you might in worst case catch chemical pneumonia. When you land, you should remove the smoke can immediately, and this is when it might come in handy with a hook knife within reach.

Video camera. Most acro pilots like to see themselves on film. You just have to admit it. If you are into acro, you are generally slightly PR-horny. Nothing wrong with this. But the video camera is also an important instrument to obtain a faster progression on your skills. It is much easier to learn from your mistakes if you can see the mistakes in rerun afterward. Take turns filming when you are out practicing, or lure a friend into filming in return for a tandem flight.

If you want to use the camera for video editing as well, and maybe make an acro movie, a digital video camera with the format miniDV is the most used. The camera should have a digital entry for small editing jobs on the PC, and an analogue entry to enable the connection of a micro camera to use during flight.



Ole Jørgen Løvland and Stein Egil Mangseth flying with their smoke cans during Red Bull Vertigo in Villeneuve, 2003.



Pocket fluff

What other things might come in handy? Here we list some things you can and should put in your harness when you are on an acro tour.

Tape. Have you heard about the club "*friends of the tape*"? Most acro pilots regard the tape as a very good friend. But within the category there are different friends to choose.

Repair tape should always have its place in the harness, regardless if you fly acro or other disciplines of paragliding. Roll the tape together and put it in a film can or a waterproof bag (the paper protection of the tape does not correspond well with water).

When you repair a paraglider with tape you always have to consider the strength of the cloth after repair thoroughly. If you fly a lot of acro, this consideration becomes even more important. Do not tape large rifts or damages to the front. Then the tape might be too weak.

tape, is a very strong industrial tape with very good attachment quality. This tape attaches to nearly anything, but will also leave glue leftovers. Used to everything from attaching smoke cans to tape the program onto the thigh.



Gluebrain?

Leatherman. More often than not, when you stand on a take-off with a lot of pilots, you can hear someone shout out for a Leatherman. To those of you who do not know what it is, the Leatherman is a knife you fold together as a Swiss knife. The difference is that it is built around a pair of tongs, and that it is more solid than a Swiss knife. To the paraglider pilot it is often used to open carabines when we change lines or similar, but the rest of the tool is of very good quality as well. The original is expensive, but you will find copies of somewhat less quality for less money a lot of places. A cheap copy often does the job.

A paraglider harness shall always contain a Leatherman (or a copy) if you are a devoted pilot.

Hook knife. Maybe the only instrument you should have accessible when seated in your harness. It is a knife special made for fast cuts of lines and straps, but the cutting blade itself is protected so you do not risk cutting anything by accident. Make sure to mount it in a way that does not risk it to hook into things. Luckily we rarely hear of pilots who have been forced to use the knife in an emergency, but it is also handy for small repairs on lines and cloth.



Most kinds will be able to take care of the easier jobs.



Hook knife, also called a strap cutter.

Spare lines are great to bring. It is so annoying to be there on take-off and discover that some lines are gone or bad. But it is also not a good idea to fill the harness with all dimensions and lengths of lines. You will have to rationalize some. The lines the most exposed to damages are the ones attached to the rear end of the glider, closest to the glider. These are normally the thinnest ones. For this reason, do bring a couple of lines with a sewn loop in one end. The length is adjustable by tying a loop at the other end. Now you end up with a line you can use until you have a chance to buy original lines.

In addition to these thin lines, it might be a good idea to bring some spare brake lines.

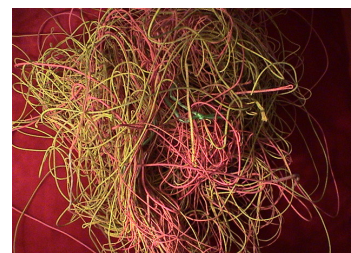
The lines are also used to attach things as smoke cans, cameras and other gadgets you prefer not to loose between take-off and landing.

Sewing gear. The sewing machine is left at home, but needle and thread belongs on a trip. Damaged seams on the paraglider or the harness, must of course be stopped and repaired as soon as possible. Why not do it straight away? If you have needle and thread in the harness this is quickly done. Preferably use some glossy nail polish on exposed places to lock the seam even better.

On places where extra strength is needed you can try to sew with dental floss. Just remember to attach it even better since it is very smooth and the seam will come undone easier than a normal sewing thread.

Shopping list to the pocket fluff:

- 1 roll Spinnaker tape
- 1 roll Gaffa tape
- 1 pcs Leatherman
- 1 pcs Hook knife
- 3 pcs Spare thin lines
- 2 pcs Brake line
- 1 pcs Sewing needle big
- 1 pcs Sewing needle small
- 1 roll Sewing thread
- 1 roll Dental floss



A line to every situation.

Manoeuvres

This chapter deals with how to perform the manoeuvres and the details of each and every manoeuvre an acro pilot should know.

Index manoeuvres:

1. Descent:
 - 1.1. Big ears
 - 1.2. B-stall
 - 1.3. 360's (spiral dive) (acro basic manoeuvre 1)

2. Deformation / Simulation :
 - 2.1. Asymmetric deflation
 - 2.2. Symmetric deflation
 - 2.3. Autorotation
 - 2.4. Spin-stop
 - 2.5. Spin
 - 2.6. Full stall
 - 2.7. Deep stall

3. Glider control / Acro:
 - 3.1. Pitch- pendulum
 - 3.2. Wingovers (acro basic manoeuvre 2)
 - 3.3. Spinover
 - 3.4. Asymmetric spiral (acro basic manoeuvre 3)
 - 3.5. Reversal
 - 3.6. SAT
 - 3.7. Dynamic SAT
 - 3.8. Tumble
 - 3.9. Rhythmic SAT
 - 3.10. Switchy SAT
 - 3.11. Helicopter
 - 3.12. Twister
 - 3.13. Mc Twist
 - 3.14. Misty Flip

1. Descent:

1.1. Big ears

1.1.1. Description: The outer part of the front is folded on both sides. This makes the flight areal smaller and less effective. It looks like the glider puts in its ears when the manoeuvre is performed, hence the name.

Sink rate: 3-5m/s.

1.1.2. Purpose: To descend faster than during regular flight. Used when it is important to keep direction and speed. Mostly used to exit turbulent areas, to avoid cloud flying, to get out of clouds, top-land and if you do not want to overshoot the landing.

1.1.3. Execution:

- a. **Entry:** Sit straight in the harness in order to reach the outer A-line on each side as high up as possible. Pull down the lines until the outer part of the front is folded on each side. Some say you should pull in one ear at a time to avoid deflation.
- b. **Maintenance:** Hold the outer A-lines as long as you need to keep the ears in place. On some gliders the ears stay in even if you let go of the lines, but they might pop out again at any time due to turbulence or turn, so it is better to hold on to the lines. Use weight shift to steer.
Best result is achieved by the use of speed bar at the same time.
- c. **Release:** Let go of the A-lines. If the ears do not come out within five seconds, you can apply a quick pump with the brakes to get them out.

1.1.4. Dangers:

- a. **Deflation:** If you pull the lines to far down, the whole riser might come down with it with the result of a frontal tuck on one side.
- b. **Stall:** When you fly with your ears in, the angle of attack is increased considerably. This leads to a lower risk of deflation, but you are much closer to the stall limit. This is why the speed bar is applied. Do not push the speed bar until the ears are pulled in. Apply some brake when you pump out the ears. The ears should not be taken out on the same time as you go through the wind gradient, e.g. on landing.

1.1.5. Manoeuvres to practice before: None in particular.

1.2. B-stall

- 1.2.1. Description:** The entire B-line cascade is pulled down and the glider is consequently thinner lengthwise. This breaks up the laminar airflow which produces the lift of the glider, and the glider enters a controlled stall.
Sink rate: 7 to 10 m/s.
- 1.2.2. Purpose:** B-stall is used to descend faster than during ordinary flying. Here sink is more important than forward speed. A manoeuvre mainly used to avoid getting sucked into big clouds, to get out of clouds or to descend in extreme lift.
- 1.2.3. Execution:**
- a. **Entry:** Put three fingers between the b-lines where they are attached to the riser. Pull down quickly and simultaneously approximately 20 cm on both sides. The glider will fall back a little, but stabilises quickly over the pilot's head.
 - b. **Maintenance:** Hold the lines down as long as you want to keep the b-stall. To increase the sink you can pull even further, but this will make the glider less stable in yaw.
 - c. **Exit:** Let go of the b-lines symmetrical. You do not have to physically let go of the lines, just give in to the resistance and move your arms quickly upwards. Let the glider dive and only apply brake if it shoots too far. It is important to let the glider regain its speed directly after the exit.
- 1.2.4. Dangers:**
- a. **Spin:** If you let go too slow or/and asymmetrical, the glider might enter a spin. If it does – quickly release both sides and the glider will fly out of it.
 - b. **Deep stall:** If you let go of the risers too slow, the glider might enter a deep stall. Give one quick pump with both brakes and let the glider dive some to build up some speed. If this does not help, you can try to gently put some pressure on the a-risers or use the speed-bar to build up the speed.
- 1.2.5. Manoeuvres to practice before:** None in particular.

1.3. 360s (spiral dive) (acro basic manoeuvre 1).

1.3.1. Description: The glider is pulled into a turn so hard that the front almost goes horizontal, pointing downwards. The centre of the rotation lies well above the glider. This is the manoeuvre that gives the deepest sink, but it is also difficult to hold a long time because of large g-forces. Should not be used if you get into a cloud, where you quickly lose orientation and risk vertigo. Sink rate: 10-20 m/s.

1.3.2. Purpose: To descend as fast as possible when forward speed is not an issue. It is mainly used to get down in extreme lift, or if one simply wants to get down fast e.g. for landing etc.

1.3.3. Execution:

- a. **Entry:** Fly full speed (trim speed) and quickly turn to one side with full weight shift to the same side. Weight shift and brake should be applied simultaneously in order to achieve a quick entry.
- b. **Maintenance:** Hold the position until you feel the increase of speed. Well established in the spiral, you can position yourself a bit more neutral in the harness and apply some brake on the outer wingtip to prevent tiny deflations on the outside. Now you can adjust the sink simply by applying more or less brake, or more or less weight shift.
- c. **Exit:** Position yourself neutral in the harness. Let go of the inner brake gently. Maintain light brake on the outside. As soon as you feel the glider exit the spiral; gently turn it again in the same direction together with some weight shift. This way you use up the energy in a turn instead of in a big pendle.

1.3.4. Dangers:

- a. **Spin:** If you pull too much brake at the entry, or try to enter a spiral from low speed, the glider might enter a spin. Immediately let go of the brake before it has turned 180 degrees.
- b. **Deflation:** If you leave the manoeuvre too fast, and the sink was big, the pitch pendle on the exit might be so large that you risk getting a deflation. Normally nothing to worry about, and the deflation is rarely big.
- c. **Blackout:** The spiral dive puts the pilot under strong forces. At any indication of black out, or seeing stars, you should quickly get out of the spiral.

1.3.5. Manoeuvres to practice before: None in particular.

2. Deformation / Simulation

2.1. Asymmetric tuck

- 2.1.1. Description:** The front of the glider is folded in on one side. The size of the asymmetric tuck is given in percent, depending on how large the part of the front tucked in is. Normally you pull 50-60% when you practice this manoeuvre. You can get an asymmetric tuck when the angle of attack is too low on parts of the glider, mainly due to turbulence. You can also induce the tuck by pulling down one of the a-riser sets.
- 2.1.2. Purpose:** This manoeuvre has for sole purpose to let the pilot get better accustomed to situations that can occur during normal flying in thermals or in turbulence.
- 2.1.3. Execution:**
- a. **Entry:** Fly full speed (trim speed), grip the top of one of the a-risers and pull down. Pull gentle the first time you try the manoeuvre. When you get comfortable with the manoeuvre, you can pull faster in order to obtain a more violent entry.
 - b. **Maintenance:** Keep the a-riser down as long as you want to keep the deflation. Try to position yourself as neutral as possible in the harness to avoid the glider to enter a rotation. If necessary, you can gently apply a little brake on the flying side of the glider.
 - c. **Exit:** Let go of the a-riser and sit neutral in the harness. The front will now begin to unfold. If necessary, pump out the folded side with a long pump.
- 2.1.4. Dangers:**
- a. **Spiral / autorotation:** If you do not counter the turn at all, neither with brake or weight shift, the glider will pretty soon enter a rotation. After a few turns it will be in a heavy spiral dive – an autorotation. Immediately let go of the a-riser and pump out the deflation if necessary.
 - b. **Spin:** Upon the use of too much counter steering, especially when you apply opposite brake on large deflations (over 50%), the glider might stall and enter a spin. This is extremely dangerous since the exit of a spin might be very violent where the glider dives very far with a new deflation, and possibly a cravatte, as a consequence.
 - c. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. You rarely get a cravatte when you have induced the deflation. But if you get a deflation due to a bad exit after a spin or because the glider has slid sideways, a cravatte may be upon you. First of all; counter the turn as you do on a normal deflation. Secondly; try to pump out the cravatte. If this does not help; try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either, you can try to solve the problem with a full stall. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.
- 2.1.5. Manoeuvres to practice before:** Big ears.

2.2. Symmetrical tuck / Frontal

2.2.1. Description: The entire front of the glider is pulled down. Symmetrical tuck occurs due to a too low angle of attack on the entire glider. Primary due to strong turbulence, but it can also be induced by pulling down the entire a-line set during a test situation.

2.2.2. Purpose: The purpose of the manoeuvre is solely to let the pilot get better accustomed to situations that can occur during normal flying in thermals or in turbulence.

2.2.3. Execution:

- a. **Entry:** Fly full speed (trim speed), grab the top of both a-risers and pull down. The first time you try the manoeuvre, pull gently. Later you can pull down faster in order to achieve a more violent tuck.
- b. **Maintenance:** Keep the a-riser down as long as you want to keep the deflation. Try to position yourself as neutral as possible in the harness to avoid the glider to enter a rotation. When you pull the entire front down, the glider will seek out itself, and some gliders will try so hard that you will not be able to keep the front tucked.
- c. **Exit:** Let go of the a-risers and position yourself neutral in the harness. The glider will quickly unfold itself. At some few occasions, where you have pulled the a-risers very hard, the glider might have entered a kind of stall with the front in. If this is so, give the glider a quick and deep pump with both brakes and let the glider build up some speed at the exit. If necessary, damp the following pendulum.

2.2.4. Dangers:

- a. **Stall due to a large tuck:** If you pull down really hard, the front might fold in and stay this way. The glider enters a kind of stall and will not exit without brake input.
- b. **Stall due to over correction:** A symmetrical deflation will on almost every occasion get out on its own. Do not pump out the glider if it is not necessary, and especially do not do it when the glider is moving backwards. If you pull too much brake at the wrong time, the glider might stall.
- c. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. You rarely get a cravatte when you have induced the deflation. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

2.2.5. Manoeuvres to practice before: Big ears, asymmetric tuck.

2.3. Autorotation

2.3.1. Description: If you get a large asymmetric deflation (50-60%) and do not counter it, the glider will go into a rotation. First a spiral and then autorotation. During an autorotation the center of the rotation will be between the pilot and the glider, as in a SAT, where the pilot moves backwards and the glider forward in a spiral. If you also have a cravatte, the autorotation will be very strong.
Sink rate: 6-12 m/s.

2.3.2. Purpose: This manoeuvre does not have any other purpose but to make the pilot familiar with situations that might occur if you do not counter a deflation.

2.3.3. Execution:

- a. **Entry:** Fly full speed (trim speed), reach for the top of one of the a-risers and pull it down. The first time you try it, you pull slow. Later you can pull it down harder to induce a more violent entry. To get the glider into rotation, let yourself fall down in the harness on the deflated side.
- b. **Maintenance:** Hold the a-riser down and let the glider rotate. Do not counter the turn.
- c. **Exit:** Let go of the a-riser and try to position yourself neutral in the harness. Pump out the deflation if necessary. The glider will exit the spiral when the deflation is out. This normally comes out quickly due to the high internal pressure the glider have when you are in a spiral.

2.3.4. Dangers:

- a. **G-forces:** Strong g-forces (centrifugal forces) might make it difficult to throw the reserve if this is necessary. Make sure to know where the handle is and that it is easy to reach in any situation that might occur.
- b. **Blackout:** The spiral dive puts the pilot under strong forces. At any indication of black out, or seeing stars, you should quickly let go of the a-riser and steer out of the spiral.
- c. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. You rarely get a cravatte when you have induced the deflation. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

2.3.5. Manoeuvres you shall practice before: Big ears, spiral dive, asymmetric tuck.

2.4. Spin-stop

2.4.1. Description: Half the glider stops flying due to a angle of attack too high while the other side still flies. This might happen when you for example fly with too much brake in thermals and turbulence, or fly too slow on a hang and make a sharp turn. In this manoeuvre you will exit the spin before the glider has rotated more than 180°.

2.4.2. Purpose: The purpose of the manoeuvre is to get the pilot accustomed to the gliders reactions when it enters a spin, as well as getting to know where the spin limit is when you fly with a lot of brake.

2.4.3. Execution:

- a. **Entry:** Fly slow close to the stall limit. When you feel ready, pull one of the brakes all the way down (full brake) and let the other brake almost all the way up (full speed).
- b. **Maintenance:** Keep the one brake down and the other up until the glider has rotated approximately 90°.
- c. **Exit:** Swiftly let go of the brake and let the glider dive and fly out the energy.

2.4.4. Dangers:

- a. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist has more than 1 turn the brakes will lock themselves and you will need to steer the glider with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- b. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. If the glider exits the spin sideways, you often get a deflation which again might lead to a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

2.4.5. Manoeuvres to practice first: Slow fly, spiral dive, asymmetric deflation.

2.5. Spin

2.5.1. Description: Half the glider stops flying due to a too high angle of attack while the other side still flies. This might happen when you e.g. fly with too much brake in thermals and turbulence, or fly too slow on a hang and make a sharp turn. The glider rotates flat around its axe and it feels like it rotates backwards.

2.5.2. Purpose: The manoeuvre has for sole purpose to make the pilot acquainted with situations that might occur if you turn too tight or fly too slow.

2.5.3. Execution:

- a. **Entry:** Fly on minimum speed, close to stall. When you feel ready, pull one of the brakes all the way down (full brake) and let the other almost all the way up (full speed).
- b. **Maintenance:** Keep the one brake down and the other up. After some rotations the energy will leave the glider, and often the glider enters a stall. To keep the rotation you need to have as little brake as possible on the outer brake.
- c. **Exit:** Brake the outer side some in order to dampen the rotation. Then let go of both sides quickly and damp the glider if it shoots far ahead. If the glider moves a lot back and forth in the spin, you can try to let go when the glider is already in front of you. Some times the glider goes far ahead after you let it go and if you are not prepared to brake it, the situation might become pretty nasty.

2.5.4. Dangers:

- a. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist is more than 1 turn the brakes will lock themselves and you need to steer the glider direct with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- b. **Blackout:** If the glider turns very fast the forces might be very strong. At any indication of black out, or seeing stars, you should quickly let go of the a-riser and steer out of the spiral.
- c. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. If the glider exits the spin sideways, you often get a deflation which again might lead to a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

2.5.5. Manoeuvres to practice first: Slow fly, spiral dive, asymmetric deflation, spin-stop.

2.6. Stall

2.6.1. Description: The glider stops flying due to a too large angle of attack. This might occur if you fly too slow in turbulence or if you pull a full stall to exit a dangerous situation. If the glider stalls due to turbulence it will normally stay open all the way and will fly again without input after it has fallen some meters. When you induce a full stall, the glider will deform itself since the wingtips are pulled backwards by the brake lines.

2.6.2. Purpose: This manoeuvre may be used to "reset" the glider. This means that you can use the stall when you need to get out of other more dangerous situations, like a cravatte or a spiral with twisted lines. Just remember that full stall is a potential dangerous manoeuvre.

2.6.3. Execution:

- a. **Entry:** Take one wrap on each brake line. Fly slow close to stall limit. When you feel ready, pull full brake on both sides and lock the arms in this position. The brake pressure is extremely high.
- b. **Maintenance:** Lock the arms on full brake, and do not release because of the high brake pressure.
If the glider works back and forth, try to find the rhythm. You might have to let a few centimetres of the brake lines go, to decrease the pendulum.
- c. **Exit:** Let go of the brakes slowly and only half way up when the glider is on its way forward in the pendulum. If the glider lays stable you just let go when you feel like it. It is very important that you just let go a bit first, letting the glider fill itself up again while it is still in stall (or deep stall).
When the middle of the glider has regained pressure, you quickly let go of the brakes. Let the glider shoot some in front of you to build up the speed, but if it shoots fast it will also shoot far, and you will have to dampen the dive.

2.6.4. Dangers:

- a. **Spin:** If you let go of the brake lines slowly and asymmetrical the glider might enter a spin. If this happens, take the stall once again.
- b. **Fall into the glider:** This is almost impossible, but if you let go of the glider in the complete wrong moment, e.g. when the glider is far behind you right after the entry, the glider might shoot so far ahead that you in worst case fall into the glider. If you do not fall into the glider, you will at least get a large deflation and possibly a cravatte.
- c. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. If the glider exits the stall sideways, you often get a deflation which again might lead to a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall.
If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

2.6.5. Manoeuvres to practice first: Slow fly, asymmetric deflation.

2.7. Deep stall

2.7.1. Description: This is a kind of stall where the glider is inflated and to the pilot it looks like the glider flies. Old and worn out gliders are known to enter a deep stall after e.g. a B-stall or a bad take off in nil wind. Deep stall occurs when the angle of attack is in the area between stall and not stall and the glider falls more or less straight down. On some occasions, when only parts of the glider are in deep stall, the glider can still fly forward but with a very large sink and a poor glide. When you induce a deep stall the glider will fly backwards.

2.7.2. Purpose: The manoeuvre is executed in order to get the pilot to recognize the stall limit of the glider.

2.7.3. Execution:

- a. **Entry:** Take one wrap on each brake line. Fly slow close to the stall limit. When you feel ready, you give full brake with both brakes and when the glider folds backwards, you slowly move the arms up a bit again.
- b. **Maintenance:** Now you have to balance the brake pressure. The glider shall look inflated but it shall not fly. It is almost impossible to the pilot to discover that the glider flies backwards if he/she does not have terrain close by to compare with. The more you let go, the prettier the glider will look, but the larger the possibility that the glider suddenly catches in, shoot in front and flies again.
- c. **Exit:** When you want to exit the manoeuvre, you quickly let go of the remaining brakes. Let the glider shoot ahead some in order to build up some speed. If it shoot ahead very fast it will also shoot far and you have to dampen the dive.

2.7.4. Dangers:

- a. **Stable deep stall:** If the glider is still in deep stall after you have let it go, it has entered a stable deep stall. Give the glider a fast pump with the brakes and let it fly out. If this does not help, you will have to lower the angle of attack by pulling the a-risers or press the speed bar to get the glider to fly.
- b. **Spin:** If you let go slowly and asymmetrical the glider might enter a spin. Let the brakes go and steer yourself out of the situation.
- c. **Fall into the glider:** This is almost impossible, but if you let go of the glider in the completely wrong moment, e.g. when the glider is far behind you right after the entry, the glider might shoot so far ahead that you in worst case fall into the glider. If you do not fall into the glider, you will at least get a large deflation and possibly a cravatte.
- d. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. If the glider exits the stall sideways, you often get a deflation which again might lead to a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

2.7.5. Manoeuvres to practice first: Slow fly, asymmetric deflation.

3. Glider control / Acro :

3.1. Pitch- pendulum

3.1.1. Description: By the use of brakes you can make the glider dive in front of you, fall behind you, dive in front of you and so on. All this in a rhythmical movement which makes the pendulums larger and larger. It is all about finding the rhythm on when to pull down and when to let go of the brakes, as well as daring letting the glider shoot ahead.

3.1.2. Purpose: This manoeuvre teaches the pilot the limits of how far the glider can shoot ahead without deflating. The pilot also gets to know the rhythm of the glider and how he/she can enhance it with the brakes.

3.1.3. Execution:

- a. **Entry:** Fly full speed (trim speed) and smoothly pull the brakes deep down. Let the glider move behind you. When it is at its furthest, rapidly let go of the brakes again and let the glider dive.
- b. **Maintenance:** When the glider is almost as far ahead as it can be, you once again pull the brakes deep down, hold until the glider is well behind you and hold until the glider is on its way forward again. Let go.
Find the rhythm and repeat the sequence over and over again.
- c. **Exit:** Let the glider dive and fly out the energy. You can brake the glider on its way ahead in order to get a faster exit. If you choose to do this you will have to make sure to let go of the brakes before the glider falls back again. It is important that you do not kill all the energy in the last pendulum, rather let it fly.

3.1.4. Dangers:

- a. **Stall:** If you are too hard on the brakes, the glider might enter a stall. If this happens, whatever you do, do not let go of the glider when its way behind you. Rather hold the brakes down and let go when the glider has stabilised above your head.
- b. **Symmetrical deflation:** There is rarely anyone cool enough to let the glider shoot ahead until it deflates. Deflations that occur due to a symmetrical dive will normally go out on its own when the body pendles under the glider again. Make sure to not over correct the deflation with a pump.
- c. **Asymmetric deflation:** If you use the brakes very asymmetrical, and on top of it too hard, you might get an asymmetric deflation when the glider dives. Counter it carefully since the deflation most likely comes out on its own when the body pendles back in under the glider.
- d. **Cravatte:** Cravatte means that parts of the foil are tangled in the lines. If the glider shoots far ahead and sideways the consequence is usually a deflation which again might lead to a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall.
If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

3.1.5. Manoeuvres to practice first: None in particular.

3.2. Wingovers (acro basic manoeuvre 2)

3.2.1. Description: By some brake input and a lot of weight shift you can make the glider do large roll pendles from one side to the other. All in a rhythmical movement which makes the pendles larger and larger. It is all about finding the exact moment to turn the other way, as well as let the glider dive and still take one more pendulum. And then one more. And then one more...

3.2.2. Purpose: The manoeuvre is used to let the pilot familiarise him/herself with the rhythm of the glider as well as getting used to seeing the glider vertical on the side of him/herself and even under him/herself sometimes, without panicking.
To pilots who want to practise a lot of acro this is the most important basic manoeuvre and it needs to be practised a lot before you move on to more advanced manoeuvres.

3.2.3. Execution:

- a. **Entry:** Fly full speed (trim speed). Lean hard to one side in the harness and make a hard turn to this side. When the glider lays front down, hold it some, then let go and turn hard to the other side with a lot of weight shift.
- b. **Maintenance:** When the pendulum begin to build up you apply less and less brake, but still a lot of weight shift. Remember to complete the turns so the front points down before you change direction. In this way the glider dives forward and builds up speed to the next pendulum instead of pendle out to the side without energy. When you change direction you have to begin with weight shift, then use the brake carefully when the glider is at the bottom of the pendulum.
- c. **Exit:** Let the glider dive and fly out the energy. You might have to apply brake on both sides when the glider dives in order to get an exit with less pendulum.

3.2.4. Dangers:

- a. **Asymmetric deflation:** If you get high in the pendulum, but do not finish the turn all the way around with the front down, the glider will slide sideways and the inner part of the glider might collapse. Over correction might get you into a new pendulum and a new deflation on the other side.
Deflation on the outside wing is normally undramatic but it is a sign of a too tight turn. Use less brake and apply it a bit slower. Use more weight shift instead. Remember that deflations steel a lot of energy and speed and it might lead to not enough energy to next pendulum. After a deflation on the outer side the next pendulum should be calmed down to avoid a complete stop at the top without energy to fulfil the turn.
If the pendulums exceed 90 degrees you normally have to give some brake on the outer side while the pendulum is on its highest. This to keep the pressure in the glider and to avoid an outer deflation. This is even more important if you enter the pendulum slowly and do not have the speed and energy e.g. if you are light in the glider.
- b. **Cravatte:** Cravatte means that parts of the foil are tangled in the lines. If you get a large deflation on the inner wingtip you might get a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall.
If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

- c. **Spin:** If you apply too much brake the glider might in worse case enter a spin. If it does, the spin will have a lot of energy and rotate very fast. You have to react swiftly and let go of the brakes immediately when you feel the glider spin. This kind of spin is under controlled circumstances called a Mc Twist.

3.2.1. Manoeuvres to practice first: None in particular.

3.3. Spinover

3.3.1. Description: Almost as wingovers, but instead of high, clean turns, you spin the glider 180 degrees at each pendulum.

3.3.2. Purpose: This manoeuvre is not really regarded as an own manoeuvre in international competitions, but it is a nice practice when you begin to sniff at the McTwist.

3.3.3. Execution:

- a. **Entry:** Fly full speed (trim speed). Position yourself neutral in the harness and pull full brake to one side. When the glider has done one 90 degree turn in spin you quickly release. The glider will continue the rotation to approximately 180 degrees before it dives to build up the speed.
- b. **Maintenance:** Let the glider dive in front of you, pendle and then climb back up again before you spin the glider 90 degrees the other direction. The glider will again continue to rotate 180 degrees and then again dive in front of you. Repeat the sequence. It is very important that you let the glider climb almost all the way until it stops before you spin it.
- c. **Exit:** Let the glider dive in front of you and fly out the energy. You might apply some brake on both sides when the glider is about to dive, this way you will have a smaller pendulum on your exit.

3.3.4. Dangers:

- a. **Spin:** If you keep the brake to long the manoeuvre can change into a violent spin. If you have passed 360 degrees, it's better to hold the spin until it calms down. It is also possible to slow the whole glider down and steer it out as you do from a normal spin.
- b. **Mc Twist:** If you pull the brake all the way down too early, while the glider still has a lot of speed and energy, the result might be a Mc Twist out of control. This is not desirable at all. Read more about the dangers with a Mc Twist. If this happens, you shall brake the whole glider and wait until the rotation calms down before you fly out the glider as from a normal spin.
- c. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist is more than 1 turn the brakes will lock themselves and you need to steer the glider with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- d. **Cravatte:** Cravatte means that parts of the foil have wound itself into the lines. If the glider exits the spin sideways, you often get a deflation which again might lead to a cravatte. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall. If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.

3.3.5. Manoeuvres to practice first: Spin, spin-stop and wingovers.

3.4. Asymmetric spiral (acro basic manoeuvre 3)

3.4.1. Description: With some brake input and a lot of weight shift you can make the glider to make large pendulums in roll. All the pendulums are made to the same direction. All in a rhythmical movement which makes the pendulums larger and larger. It is important to not confuse this manoeuvre with some kind of spiral, even if the name suggests it. It is more like a wingover repeated to the same side over and over again. It is all about finding the rhythm. When to make the turn and when to let go. As well as daring to let the glider go high and still take yet another pendulum. And then one. And then one...

3.4.2. Purpose: This manoeuvre allows the pilot to get to know the glider's own rhythm as well as to get used to see the glider vertical and even some times under him/herself without to panicking.

To pilots who want to practice more acro, this is one of the most important basic manoeuvres and it has to be practiced a lot before you move on to more advanced manoeuvres.

3.4.3. Execution:

- a. **Entry:** Fly full speed (trim speed). Lean over to one side in the harness and make a hard turn to this side. When the glider goes over, hold it some, then let go. Just before the glider goes back to straight flying, you once again turn hard in the same direction with a lot of weight shift but less brake.
- b. **Maintenance:** When the pendulums begin to build up you shall use less and less brake, but still a lot of weight shift. Remember to finish the turns with the front pointing down before you begin the next pendulum. You can also use some weight shift to straighten the glider up before you go on to the next pendulum to the same direction as the last one.
- c. **Exit:** Let the glider dive ahead and fly out the energy. You can apply some brake when the glider shoots in front in you, in order to obtain an exit with less pendulation.

3.4.4. Dangers:

- a. **Asymmetric deflation:** If you get very high in the pendulum but do not execute the turn all the way round with the front pointing down, the glider will slide sideways and the inner tip might collapse.
If you get a deflation on the outer side, it is normally undramatic and only a sign of a too aggressive turn.
- b. **Cravatte:** Cravatte means that parts of the foil are tangled in the lines. If you get a large deflation on the inner wingtip you might get a cravatte. But it rarely happens on these kind of manoeuvres. Counter the turn as in a deflation. Try to pump out the cravatte. If this does not help, try to find the stabiliser line on the cravatted side and pull it down until the cravatte comes out. If this does not help either you might try a full stall.
If the glider at any time enters a spiral or autorotation with cravatte, the reserve shall be thrown immediately.
- c. **Spin:** If you apply too much brake the glider might in worse case enter a spin. If it does, the spin will have a lot of energy and rotate very fast. You have to react swiftly and let go of the brakes immediately when you feel the glider spin. This kind of spin is under controlled circumstances called a Mc Twist.

3.4.5. Manoeuvres to practice first: Wingovers.

3.5. Reversal

3.5.1. Description: This manoeuvre is also wrongly named a loop. It is really a roll, but the movement that occurs is kind of a mix between a roll and a loop. To make the manoeuvre you need to build up a lot of energy. This can be done e.g. with an asymmetric spiral. Then you reverse the pendulation by turning the other way, and voilà; a reversal. The difference between a reversal and wingovers is that the energy is higher and you can more easily pass the glider straight above it in a way that allows the illusion of flying upside down, or in a loop, if a photo was taken at the exact right time.

3.5.2. Purpose: This manoeuvre is above all fun to do, as well as spectacular to the spectators. It is also a very important manoeuvre to an acro pilot.

3.5.3. Execution:

- a. **Entry:** Build up speed and energy through an asymmetric spiral. After two to three pendulums you should have energy enough to reverse like in a wingover but even higher.
- b. **Maintenance:** A reversal is normally only done once. If you change direction one more time, you will obtain high wingovers, not a reversal. But you can after the first reversal move on to a new asymmetric spiral in the other direction and then do a new reversal.
- c. **Exit:** Move on to a couple of wingovers or an asymmetric spiral to use up the energy and fly it out.

3.5.4. Dangers:

- a. **Asymmetric deflation:** Look at wingover.
- b. **Fall into the glider:** If you do not have speed and energy enough when you do the reversal, or if you pull it in too late, you might lose the pressure in the glider and free fall. In worst case into the glider. This is absolutely the worst situation you can get yourself into. If possible – throw the reserve. Say you prayers.
- c. **Cravatte:** After a free fall where you do not fall into the glider, you might still have large problems with cravatted deflations. Pump it out, pull in the stabilo line or stall the glider to get out of the problem.
- d. **Spin:** If you use too much brake, the glider might in worst case enter a spin. If it does, the spin will have a lot of energy and rotate very fast. You have to react swiftly and let go of the brakes immediately when you feel the glider spin. This kind of spin is under controlled circumstances called a Mc Twist.

3.5.5. Manoeuvres to practice first: Wingovers, asymmetric spiral.

3.6. SAT manoeuvre

3.6.1. Description: The manoeuvre which revolutionised acro paragliding. Invented by Raul Rodriguez, named after SaftyAcroTeam founded by Raul.

The manoeuvre looks like a mix between a spin and a spiral dive and this is also exactly what it is. It also reminds a lot of an autorotation. The glider flies forward, as a contrary to spin, but the pilot's body rotates backwards where the centre of the rotation is in the middle of the pilot and the glider. A SAT well executed can give as little sink as 3.5-4.5 m/s.

3.6.2. Purpose: The manoeuvre is above all fun to do and spectacular to look at. You get to know the spin point of the glider very well. It is also a very important manoeuvre when it comes to acro.

3.6.3. Execution:

- a. **Entry:** Fly full speed (trim speed). Wrap one of the brakes once or twice. The other one has to be completely let up. Hold the hand without the wrap on the top of the riser and push away your upperbody to enhance the weight shift while you simultaneously pull a hard entry of a spiral dive with the other hand.
When the glider has rotated approximately 180° and is about to enter a spiral, pull some more brake and keep the weight shift. After approximately two rounds with something that feels like a SATan's spiral, the rotation speed will decrease and the glider will get the SAT angle.
- b. **Maintenance:** Keep the weight shift and pull as much brake as you are able to without breaking the glider in the middle and enter a spin.
- c. **Exit:** Gentle let go of the brake and swiftly leave the SAT with a lot of energy. The exit is perfect to be connected with an asymmetric spiral.

3.6.4. Dangers:

- a. **Spin:** If you pull too much brake before the glider has built up enough speed in the entry you will have a SAT-like spin. After one rotation, it will move on into a normal spin.
- b. **SATan's spiral:** If you pull the additional brake too late the glider will never get the right angle to enter a SAT, but it stabilizes somewhere in between a SAT and a spiral. In this situation it is not unusual to get a sink rate closer to 20 m/s. Calmly steer yourself out of the situation.

3.6.5. Manoeuvres to practice first: Spiral dive, wingovers, asymmetric spiral and spin.

3.7. Dynamic SAT/Asymmetric SAT

3.7.1. Description: A development of the SAT manoeuvre. Instead of rotating horizontal like in a normal SAT, you now move the rotation asymmetrical like in an asymmetric spiral. To go into it, enter the SAT when the glider is in a pendulum movement or dives after an earlier manoeuvre.

3.7.2. Purpose: The manoeuvre is most of all fun to do and spectacular to watch for the spectators. This is also the entry gate to the more extreme manoeuvre the Tumble.

3.7.3. Execution:

- a. **Entry:** Begin with building up a careful asymmetric spiral. When the glider is on the bottom of a pendulum and it is time to begin the next one, you pull really hard and enter a SAT.
- b. **Maintenance:** Keep the weight shift and pull as much brake as you are able to without breaking the glider in the middle and enter a spin. If the angle of the entry was not too high, the manoeuvre will gradually change into a regular SAT. If the pendulum was very high and the energy great at the entry, the pendulums might build up more and more, but since you will also lose some energy in each pendulum it is important that you exit in time.
- c. **Exit:** Swiftly let go when the front points downwards and steer out the energy e.g. in a spiral dive. If the manoeuvre has altered into a regular SAT, you exit it like a SAT.

3.7.4. Dangers:

- a. **Spin:** If you pull too much brake before the glider has built up enough speed in the entry you will have a SAT-like spin. After one rotation, it will move on into a normal spin.
- b. **SATan's spiral:** If you pull the additional brake too late the glider will never get the right angle to enter a SAT, but it stabilizes somewhere in between a SAT and a spiral. In this situation it is not unusual to get a sink rate closer to 20 m/s. Calmly steer yourself out of the situation.
- c. **Mc Twist:** If you pull the brake all the way down without massive weight shift, you risk spinning the glider on the worst possible time and you will get into a mc Twist out of control. This is not desirable. Read more on the dangers of a mc Twist. If this happens you shall brake the glider and wait until the rotation calms down before you fly it out like from a regular spin.
- d. **Tumble:** If you enter a dynamic SAT with too much energy, wait too long before you enter it or enter it via wingovers, the risk of an uncontrolled tumble is great. If you have energy enough to execute it, fine. If you do not have energy enough you will have to steer yourself out already after the first rotation. This demands a very quick reaction and can be very dangerous if the timing is wrong.
- e. **Fall into the glider:** If you do not have speed and energy enough when you enter it, or if you pull it in too late, you might on top of the pendulum lose all pressure in the glider and fall freely. In worst case into the glider. This is absolutely the worst that can happen. If possible, throw the reserve. Say your prayers.

3.7.5. Manoeuvres to practice first: SAT, asymmetric spiral and spin.

3.8. Tumble

- 3.8.1. Description:** The tumble is an extremely dynamic SAT. The pendulums are so high it looks like the glider loops around the body of the pilot. A real tumble has at least one rotation on a vertical axis.
- 3.8.2. Purpose:** This is an extreme manoeuvre executed to impress the spectators and to get the judges to award a maximum of points.
- 3.8.3. Execution:**
- a. **Entry:** Start out with building up a lot of energy in a large and energetic asymmetric spiral. When the glider is on the bottom of a pendulum, at the point where you would normally begin the next pendulum, you reverse with a SAT. If you have loads of energy you will not have to reverse, but you will have compensate by holding it back just a tiny bit before you enter the SAT. This is a high risk manoeuvre.
 - b. **Maintenance:** Keep the weight shift and pull as much brake as you are able to without breaking the glider on the middle and enter a spin. You will lose energy in each rotation and it is important to leave the manoeuvre in time. More than three rotations are unusual, but some pilots manage six rotations and more than that.
 - c. **Exit:** Swiftly let go when the front points downwards and steer the energy out e.g. in a spiral dive.
- 3.8.4. Dangers:**
- a. **Spin:** If you pull too much brake before the glider has built up enough speed in the entry you will have a SAT-like spin. After one rotation, it will move on into a normal spin.
 - b. **Mc Twist:** If you pull the brake all the way down without massive weight shift, you risk spinning the glider on the worst possible time and you will get into a mc Twist out of control. This is not desirable. Read more on the dangers of a mc Twist. If this happens you shall brake the glider and wait until the rotation calms down before you fly it out like from a regular spin.
 - c. **Fall into the glider:** If you do not have speed and energy enough when you enter it, or if you pull it in too late, you might on top of the pendulum lose all pressure in the glider and fall freely. In worst case into the glider. This is absolutely the worst that can happen. If possible, throw the reserve. Say a pray.
 - d. **Line breakage:** A tumble puts the glider under an unbelievable number of g-forces. As much as 8 g has been measured. This means that the lines might break. If one a-line goes in a tumble, more will follow because of the increased load on the rest of them. Throw your reserve immediately.
- 3.8.5. Manoeuvres to practice first:** SAT, asymmetric spiral, spin and a lot of dynamic SATs.

3.9. Rhythmic SAT

- 3.9.1. Description:** This is a very difficult manoeuvre which begins like a regular SAT, works its way to dynamic SAT and finishes like a tumble. Perfect timing and glider control are the most important ingredients.
- 3.9.2. Purpose:** This is an extreme manoeuvre executed to impress the spectators and to get the judges to award a maximum of points.
- 3.9.3. Execution:**
- a. **Entry:** Start off with a regular SAT. When the SAT is established you swiftly let go of the brake and then re-enter the SAT as soon as the glider shows a tendency to leave the manoeuvre.
 - b. **Maintenance:** At the beginning the entries and exits are executed quickly, but when the pendulums get larger and larger, the rhythm calms down. The timing has to be perfect for you not to lose the energy in the pendulums.
 - c. **Exit:** Swiftly let go when the front points downwards and steer the energy out e.g. in a spiral dive.
- 3.9.4. Dangers:**
- a. **All the same as in:** SAT, dynamic SAT and tumble.
- 3.9.5. Manoeuvres to practice first:** SAT, a lot of dynamic SATs and tumble.

3.10. Switchy SAT

3.10.1. Description: This is a very difficult manoeuvre which starts out as a regular SAT and then is reversed to the other direction without any pause in the transit. The reversed SAT might become as high as a tumble.

3.10.2. Purpose: This is an extreme manoeuvre executed to impress the spectators and to get the judges to award a maximum of points.

3.10.3. Execution:

- a. **Entry:** We do not have information enough on this manoeuvre to be able to describe the execution of it.
- b. **Maintenance:** We do not have information enough on this manoeuvre to be able to describe the execution of it.
- c. **Exit:** We do not have information enough on this manoeuvre to be able to describe the execution of it.

3.10.4. Dangers:

- a. **All the same as in:** SAT, dynamic SAT and tumble.

3.10.5. Manoeuvres to practice first: SAT, loads with dynamic SATs and tumbles.

3.11. Helicopter

3.11.1. Description: The helicopter is a spin where the glider is completely inflated and rotates without any pendulation in pitch or in roll. It looks like the glider is the rotor of a helicopter, where the pilot rotates straight under the middle of the glider.

3.11.2. Purpose: The manoeuvre is mainly fun to do as well as spectacular to watch for the spectators. You will get to know the spin limits of the glide very well. It is also a very important manoeuvre to an acro pilot.

3.11.3. Execution:

- a. **Entry:** The methods to get into the helicopter varies. This is one of them:
Slow the glider down firmly and wait until the pendulation stops. Pull the glider into spin with one arm straight down and put the other one on top of the opposite riser with no brake. After a rotation of 90-180° (depending on what kind of glider you fly) you let the brake go almost all the way up, just enough to feel the pressure of the wingtip. Typically just around 5-10cm.
- b. **Maintenance:** Either the entry works or it does not. If it is ok, you just position yourself neutral in the harness and make sure to have no brake on the outside and even, just enough to feel the pressure, brake on the inside. If the glider shoots ahead a bit you apply some more brake and if it falls back you have to let go. This is quite difficult to time when you generally look up into the glider, and it is hard to react to the pendulations in time.
- c. **Exit:** Calmly brake down the outer side. This will make the glider stall. Then let go of the brakes on both sides and dampen the dive.
It is very important that you just let go in the middle of the rotation.

3.11.4. Dangers:

- a. **Spin:** Helicopter is a spin manoeuvre.
- b. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist is more than 1 turn the brakes will lock themselves and you need to steer the glider with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- c. **Free fall:** When you exit a helicopter the glider might dive extremely far ahead, especially if you do not brake the outer side before you exit. If the glider shoots more than 90° in front of you, you will most likely experience free fall with the problems this might lead to. The more overcharged the glider is, the larger the dive will be, the faster the movements will be and the larger the speed will be.

3.11.5. Manoeuvres to practice first: deep stall, spin, spin and spin.

3.12. Twister

3.12.1. Description: First the glider spins some rotations one way then, with as short a pause as possible, you reverse the rotation and spin the other way. A perfect twister is when the spins are helicopters.

3.12.2. Purpose: The manoeuvre is mainly fun to do as well as spectacular to watch for the spectators. You will get to know the spin limits of the glide very well. It is also a very important manoeuvre to an acro pilot.

3.12.3. Execution:

- a. **Entry:** The methods to get into the helicopter varies. This is one of them:
Slow the glider down firmly and wait until the pendulation stops. Pull the glider into spin with one arm straight down and put the other one on top of the opposite riser with no brake. After a rotation of 90-180° (depending on what kind of glider you fly) you let the brake go almost all the way up, just enough to feel the pressure of the wingtip. Typically just around 5-10cm.
- b. **Maintenance:** Let's assume you are now in a helicopter. To alter the direction you will have to brake the outer side, in the same moment as the glider stops the rotation you brake the opposite side and perform a helicopter the other way. The tricky part is to alter the rotation without the glider regaining its speed and fly out again.
- c. **Exit:** Calmly brake the outer side. This will get the glider into a stall. Then let go completely on both sides and damp the dive.
It is very important that you just let go in the middle of the rotation.

3.12.4. Dangers:

- a. **Spin:** Twister is a spin manoeuvre.
- b. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist is more than 1 turn the brakes will lock themselves and you need to steer the glider with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- c. **Free fall:** When you exit a helicopter the glider might dive extremely far ahead, especially if you do not brake the outer side before you exit. If the glider shoots more than 90° in front of you, you will most likely experience free fall with the problems this might lead to. The more overcharged the glider is, the larger the dive will be, the faster the movements will be and the larger the speed will be.

3.12.5. Manoeuvres to practice before: deep stall, spin, spin, spin and helicopter.

3.13. McTwist

3.13.1. Description: In the middle of a wingover, when the angle is on its highest, the glider is rotated one turn in a spin, then continues to fly after the pendulum.

3.13.2. Purpose: The manoeuvre is mainly fun to do as well as spectacular to watch for the spectators. You will get to know the spin limits of the glide very well. It is also a very important manoeuvre to an acro pilot.

3.13.3. Execution:

- a. **Entry:** You start off with small wingovers. When the pendulum has built up some, you wait a bit with the next pendulum. Wait until the glider climbs and loses energy before you pull full brake in order to spin the glider around. Remember to keep a neutral position in the harness.
- b. **Maintenance:** Either the entry works or it does not. Keep the brake until the front of the glider points downward, or keep the spin until it calms down.
- c. **Exit:** When the front of the glider points downward, you let go and fly out the glider.

3.13.4. Dangers:

- a. **Dynamic SAT:** If you pull the brake too early, if the glider has too much energy or if you are not strong enough to spin the glider fast, it all might end up in a very fast, energetic and dynamic SAT. Not good.
- b. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist is more than 1 turn the brakes will lock themselves and you need to steer the glider with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- c. **Free fall:** Not unusual in a mcTwist wrongly executed.

3.13.5. Manoeuvres to practice first: Spin, Spinover (wingover negative) and wingovers.

Ronny Olsen's special advice: The first times you try the mcTwist this can be done without using the wingovers. Rather try to make a quick turn and when the glider pendles in, you spin the glider. This way you will get a softer beginning to your mcTwist practice.

3.14. MistyFlip

3.14.1. Description: In the middle of a wingover, when the angle is on its highest, the glider is rotated one turn in a helicopter, then flown out after the pendulum. This manoeuvre looks a lot like a mcTwist, but the glider have to be inflated through the entire manoeuvre. This means that the manoeuvre rarely get as high as a mcTwist.

3.14.2. Purpose: The manoeuvre is mainly fun to do as well as spectacular to watch for the spectators. You will get to know the spin limits of the glide very well. It is also a very important manoeuvre to an acro pilot.

3.14.3. Execution:

- a. **Entry:** You start it out with small wingovers. Wait until the glider climbs and use the energy before you spin the glider.
- b. **Maintenance:** When the glider has begun the rotation, you let go of some of the brake to obtain a spin more like a helicopter.
- c. **Exit:** When the glider still is behind you, you let go and fly out the glider. The glider shall fly out without passing through deep stall.

3.14.4. Dangers:

- a. **Cravatte:** The glider might dive far ahead at the exit, whit a great risk of cravattes.
- b. **Dynamic SAT:** If you pull the brake too early, if the glider has too much energy, or if you are not strong enough to spin the glider fast, the whole thing can end up in a very fast, energetic and dirty dynamic SAT. Not good.
- c. **Twist:** If the glider enters the spin very fast, or if the rotation alters direction (e.g. on exit) the risers might twist. If the twist is more than 1 turn the brakes will lock themselves and you need to steer the glider with the lines above the twist and/or twist out as fast as possible. If the glider flies smoothly this is normally not difficult, but if the glider enters a spiral or stays in the spin, the reserve shall be thrown.
- d. **Free fall:** Not unusual in a MistyFlip wrongly executed.

3.14.5. Manoeuvres to practice first: Spin, spinover (wingover negative) and wingovers.

Contents appendix:

Appendix 1
Handbook
description of aerobatics with paraglider

Appendix 2
Handbook
required manoeuvres to obtain ParaPro 4 – SIV-course

Appendix 3
Handbook
requirements for ParaPro5

Appendix 4
Handbook
accident action plan chapter 11

Appendix 5
Article
acro enters the world

Appendix 6
Article
Spin or Spiral

Appendix 7
Article
cravatte – serious danger when practising high wingovers

Appendix 1

Handbook

Description of aerobatics with paraglider

2.0. Definitions:

2.4. Extraordinary flying

Aerobatics with hang glider: Manoeuvres where the pilot provokes pitch over 30 degrees and/or roll over 60 degrees.

Aerobatics with paraglider: Stall, spin (or manoeuvres with a great risk of stall or spin, like SAT, helicopter and so on), spiral dive to the ground and manoeuvres where the pilot provokes pitch or roll over 90 degrees.

5.10. Rules for aerobatics with paraglider

5.10.1. Pilot qualification

Aerobatics with paraglider may be executed by a pilot with a valid PP5 license and/or during a SIV course acknowledged by HP/NLF.

5.10.2. Basic manoeuvres

The following manoeuvres are defined as basic manoeuvres: Spiral dive (symmetrical and asymmetrical) and wingover.

5.10.3. Glider demands

Paragliders shall not be flown outside the limitations given by the producer.
The recommendations given by the furnisher of the equipment shall be followed.

5.10.4. Demands on flysted for organised flying

When the practise is organised, during meets, courses or competitions all manoeuvres shall be executed above water with a rescue boat present on the water.

5.10.5. Minimum height

All manoeuvres shall be ended at the lowest 100 meters above the ground. Above deep water there is no height limitation. There shall be a rescue boat present on the water when the manoeuvres are executed above water.

5.10.6. Safety equipment

During all aerobatic flying the reserve parachute shall be adequate to the total weight and packed according to the producer's instruction. Recommended intervals of re-pack shall be over held. Only a dry reserve is allowed during flight.

5.10.7. Progression

It is recommended that pilots who want to begin to fly acro participate on an acro course to learn the basic manoeuvres **and** other acro manoeuvres. It is a condition that you have to master the basic manoeuvres before you move on to more difficult manoeuvres.

It is strongly advised against a too swift progression, where you move on to more advanced manoeuvres before the basic manoeuvres are learned. New manoeuvres shall be practiced with a qualified instructor and the manoeuvres have to be executed over water with a rescue boat present and alert.

5.10.8. Aerobatic flying with paraglider

There are certain specific demands to follow when it comes to a aerobatic paragliding competition in Norway:

a) Demand on authorisation

An application of authorisation has to be presented to the HP/NLF well in advance.

b) Demand on participence:

To participate in a competition it is demanded of the pilots to pass a qualification run where the pilot shows the organiser that he/she masters the basic manoeuvres, as well as other manoeuvres the organiser demands of a pilot to master.

5.10.9 Acro compendium

An acro compendium with more information on aerobatics is available through the HP/NLF.

5.11. Rules on other take-off methods, as drop from balloon or helicopter

Alternative take-off methods, like drop from balloon or helicopter, need a special aprovement from the Luftfartstilsynet. Application has to be done through the technical board of HP/NLF.

Appendix 2

Handbook

requirements of manoeuvres to obtain ParaPro 4 – SIV course

9.5.3. Para Pro 4, skills

1. Repetition: The manoeuvres necessary for ParaPro 3 has to be mastered.
2. Planning: The process of flying, state a flight plan.
3. Turns of 360 degrees: With minimum sink, flat, right and left.
4. S.I.V – course.
 - a) Stall, with stabilized glider and controlled, safe exit.
 - b) Spin, recognition and controlled, safe exit. Minimum 360 degrees of rotation.
 - c) Entry of spin, recognition and control before the glider enters a spin.
 - d) Asymmetric deflation, minimum 50% on each side. Stable direction, controlled exit.
 - e) Forceful 360 degree turns (spiral dive), right and left.
 - f) B-stall, with stabilized glider and controlled, safe exit.

Note: The manoeuvres stated in d., e. and f. can be executed outside a SIV – course. The manoeuvres shall be documented in the log book.

Before enrolling to a SIV – course, one already have to have practised throwing the reserve in a simulated situation (e.g. in a gym).

5. Hang: Take-off and flying on it.
6. Thermals: Take-off and flying in it.
7. Strong lift: Take-off and flying in it.
8. Gusts and turbulence: Take-off and flying in it.
9. Rules of traffic: Flying on hang and in thermals together with other hang- and paragliders.

9.5.4. Para Pro 4, experience

1. Minimum 40 hours in flight.
2. Minimum 5 hours on hang.
3. Minimum 3 flights with 1 hour or more in thermals.
4. Holder of a valid license at least 12 months.

Appendix 3 Handbook requirements for ParaPro5

9.6. Para Pro 5, cross country pilot (brown)

Cross country is flying where one uses the skill of soaring to fly distances away from, and maybe even back to, the local site.

9.6.1. Practice- and safety recommendations

The goal of this level is to prepare the pilot to be a safe cross country pilot, also under pressure like in shows, demo flights and competitive flying.

This level has almost no limitation of possibilities. From short flights of a couple of minutes to really demanding cross country flights where, if the conditions are right, only the pilots skills and wishes decides how far he/she can go.

Under this certificate level ones abilities as a pilot will be put to the highest test. One has to be able to plan, administrate and complete the flight within the safety boundaries while the equipment and the weather conditions have to be used with a maximum of knowledge. All this to be able to reach far. It is from the pilot, demanded a deep knowledge of the air traffic rules and the airspace. One has to be able to plan exactly what kind of equipment is needed to complete the flight in vision. Depending on the art of the flight, the right clothes, aids and safety equipment have to be taken into consideration. Transportation and retrieval, communications and procedures in an emergency situation (landing and possible injuries in a deserted/no roads terrain) also have to be taken into consideration.

Cross country demands a pilot skilled enough to find all kinds of thermals, a pilot with good abilities to fly correctly in lift and sink. One has to be aware of the airspace one fly into, in case it is a controlled airspace. One has to be able to estimate the terrain and the condition well enough to make sure not to land on illegal ground or in a place where oneself or others may be injured, as well as in deserted or no road areas). One have to be able to quickly find the best landing area in case one have to go to land immediately, and if necessary make a precision landing in a small and short landing field, possibly with a lot of obstacles. All this because possible injuries one might obtain in a bad landing/crash in the wild, might lead to serious consequences.

It is advised against cross country flying into deserted areas, into areas where there is no chance of safe landings, and over water. One always have to make sure that someone knows where the flight will take place, in case there has to be sent out a search team. If there is a risk of landing out in deserted places, an emergency package suitable to the situations that might occur should be brought along, do not forget the distress flare.

Student pilots are under no circumstances allowed to fly cross country.

If a pilot wants to compete, he/she has to possess a licence with cross country checked out for this level. The same goes for flight shows.

Pilots with the Para Pro 5 licence (Advanced Pilot licence) are allowed to practice aerobatics with paraglider. This kind of flying is a large challenge. One is closing in on the limit of what the equipment is tested for and one might easily find oneself in other situations than the one planned. A holder of the Para Pro 5 has been through a SIV course and has obtained experience to make this person prepared to learn aerobatics. The basic manoeuvres spiral dive, asymmetric spiral and wingovers have to be under complete control before the pilot moves on to more advanced manoeuvres. The acrocompendium put together by HP/NLF is recommended to all pilots interested in this kind of flying. Acro courses are also arranged around the country.

9.6.2. Para Pro 5, theoretical knowledge

Navigation:

1. Planning: Collecting information on weather, terrain, flight area, controlled airspace, airplane traffic and possible dangers. Use of maps and other publications, air traffic and weather services.
2. Weather services: How and where to get the weather forecast and other weather reports.
3. Interpretation of weather reports: Current (metar), forecast (TAF), area (IGA), map.
4. Interpretation of weather: Weather signs, identification of acceptable and dangerous conditions.
5. Air space and air traffic:
 - a) Definitions: FL, CTA, TMA, CTR, TIA, TIZ, AWY, and air space classification A, C, D, E and G.
 - b) Controlled airspace: Airways, control area, terminal area, control zone and airports. VFR/IFR traffic.
 - c) None controlled airspace: Airways, AFIS-unit, and traffic information area. Dangers, restrictions and forbidden areas.
 - d) Military traffic: Practice areas, air photos.
 - e) Publications from the National Air Traffic Control: BSL, AIC, AIP, Notam, ICAO map, publication and availability.
6. Use of map:
 - a) Routes: Hazardous/deserted terrain, alternative routes, landing areas. Communication and retrieve.
7. Equipment: For altitude and coldness. Emergency- and first aid equipment. Survival equipment. Alarm and communication equipment.
8. Standard procedures: Signals, retrieve.
9. Emergency procedures: Alarm, search team if gone missing.

9.6.3. Para Pro 5, Skills

1. Repetition: The manoeuvres of PP4 need to be mastered.
2. Planning: The process of the flight, give a flight plan.
3. Soaring: Look for and use of all kinds of lift. Flying in lift and sink, tail- and headwind, correct use of speed/sink.
4. Landing out: Precision approach to landing area. Choice of landing area, approach, control of speed and glide angle.

9.6.4. Para Pro 5, Experience

1. Minimum 80 hours of flight.
2. At least 5 cross country flights in varying lift. An approved xc-flight contains; thermalling the first thermal, glide to the next one and thermals this one, then continue the flight away from the original landing. A hang flight on the same hill is not approved as a cross country flight.

9.6.5. Para Pro 5, Airmanship requirements

The pilot has to be healthy enough to ensure his/her own safety as well as fellow pilot's during a cross country flight, this is also the requirement for flight shows, demonstration flights and competitive flying or any other flying this level of license allows.

Appendix 4 Handbook Flytrygging kap. 11

11. Flytrygging

11.1. Generel

11.1.1. Hensikt

Hensikten med HP/NLFs flytryggingsarbeid er å forebygge hendelser med fare for skade på mennesker, utstyr og tredjemanns eiendom under utøvelse av hanggliding eller paragliding.

11.1.2. Flytryggingsarbeid

Flytryggingsarbeidet er tilla gt fagsjefens ansvarsområde, og det skal utføres etter følgende modell:

- Innsamling av erfaringsdata.
- Analyse og systematisering av innsamlede data.
- Tilbakemelding til utøverne.
- Revidere regelverk og utdanningssystem på grunnlag av erfaringer.

11.2. Innsamling av erfaringsdata

11.2.1. Hendelsesrapportering

Hendelser som har medført skade eller fare for skade på mennesker, utstyr eller tredjemanns eiendom skal rapporteres til HP/NLF.

Definisjoner:

Næruhell: Hendelse som ikke har medført skade på pilot, utstyr eller tredjemanns eiendom, men skade var nær ved å skje.

Uhell: Skade på pilot, utstyr eller tredjemanns eiendom. Kun ubetydelig personskade uten behov for legebehandling eller førstehjelp.

Ulykke: Legemsskade på pilot eller tredjemann med behov for legebehandling eller førstehjelp, eller arbeidsufør minst en dag.

11.2.2. Rapporteringsansvar

Frem til eleven har trinn 2 er det instruktøren som har ansvar for å rapportere aktuelle hendelser blant elever fram til SP2/PP2. Elever med SP2/PP2 og flygere er selv ansvarlige for rapportering.

11.2.3. Lokal oppfølging av hendelser

Klubbens faglige leder er ansvarlig for at det finnes et system for lokal oppfølging og vurdering av rapporteringspliktige hendelser.

11.3. Analyse, systematisering og arkivering

11.3.1. Analyse og systematisering

Rapporter sendes HP/NLF ved den faglige ledelse for analyse og systematisering.

11.3.2. Statistikk

Det skal utarbeides årlig statistikk på bakgrunn av hendelsesrapportene.

11.3.3. Arkivering

HP/NLF skal sørge for at alle rapporter og statistiske oversikter arkiveres.

Kopi av rapport skal sendes til faglig leder i aktuell klubb for lokal arkivering.

11.4. Tilbakemelding til utøvermiljøet

11.4.1. Presentasjon

Et utvalg av rapporterte hendelser presenteres i Fri Flukt. Årlig statistikk skal gjøres kjent for klubbene gjennom kommunikasjon med faglige ledere og ved presentasjon på fagseminar.

11.4.2. Spesielle erfaringer

Spesielle erfaringer trukket ut fra rapportene skal gjøres kjent for utøverne via de faglige lederne i lokalklubbene.

11.5. Revidere regelverk og utdanningsprogram på grunnlag av erfaringer

HP/NLFs faglige ledelse skal grunnlag av erfaringsdata vurdere endringer i regelverk og utdanningsprogram.

11.6. Undersøkelseskommissjon

11.6.1. Aktuelle hendelser

Undersøkelseskommissjon settes ned etter en hendelse med stor alvorlighetsgrad.

Undersøkelseskommissjon skal alltid settes ned etter:

- Fatal ulykke.
- Oppfordring fra politi, NLF/NAK eller Luftfartsmyndighet.

Undersøkelseskommissjon kan også settes ned etter:

- Ulykke med alvorlig personskade.
- Hendelse der det er mistanke om grove utstysfeil.
- Hendelse der det er mistanke om grove brudd på regelverk.
- Oppfordring fra forsikringsselskap eller andre involverte.
- Hendelse der sportens ansikt utad krever dette.

11.6.2. Oppgaver

Formålet med undersøkelseskommisjoner er å klarlegge hendelsesforløp, årsaker og eventuelt andre påvirkende omstendigheter til en gitt hendelse.

Andre hovedoppgaver er:

- Å bistå politi og luftfartsmyndigheter i deres etterforskning.
- Anbefale eventuelle umiddelbare tiltak for HP/NLFs faglige ledelse.
- Utarbeide rapport med anbefalinger til HP/NLFs faglige ledelse.
- Informere presse og publikum.

11.6.3. Utnevning

Undersøkelseskommisjon utnevnes av seksjonens fagsjef eller den han bemyndiger.

Ved hendelser som nevnt i 11.6.1 skal fagsjefen varsles umiddelbart slik at en eventuell undersøkelseskommisjon kan settes ned raskt.

11.7. Handlingsplan for undersøkelseskommisjon

11.7.1. Rask igangsetting av arbeidet

En undersøkelseskommisjon skal gå i gang med arbeidet så raskt som mulig etter utnevning.

11.7.2. Klarlegging av hendelsesforløp

Klarlegging av hendelsesforløp er den viktigste delen av kommisjonens arbeid, og skal danne grunnlaget for resten av arbeidet. Kommisjonen bør begynne med å undersøke hendelsesforløpet, intervju eventuelle vitner, foreta åstedsbefaring, undersøke utstyr, ta bilder etc. Kommisjonen skal i undersøkelsesarbeidet følge de retningslinjer som er gitt i "Handlingsplan ved Ulykker", vedlegg B, utgitt av Hovedstyret i NAK.

Ved fatale ulykker og ulykker med alvorlig personskade har den lokale politimyndighet etterforskningsansvar. Undersøkelseskommisjonen må ikke foretar seg noe som bryter med politiets interesser, men samarbeide og stille sine kunnskaper til disposisjon. Ingenting skal flyttes eller endres på stedet uten etter anvisning eller tillatelse fra politiet. Kommisjonen må søke politiet om frigivelse av opplysninger fra vitneavhør, eventuelle medisinske undersøkelser/obduksjon etc.

En del faktorer som kan ha medvirket til hendelsen, og som derfor bør undersøkes, er:

- Pilotens bakgrunn, erfaringsnivå og aktivitet den siste tiden før hendelsen.
- Pilotens dagsform og spesielle omstendigheter.
- Utstyrets stand; type, alder, slitasje, feil og modifikasjoner. Alt utstyr sjekkes nøye (hangglider/paraglider, hjelm, seletøy, nødskjerm, eventuelt taueutstyr etc). Relevante observasjoner bør dokumenteres med bilder.
- Spesielle forhold på flystedet, generelt og ved aktuelt tidspunkt.

11.7.3. Anbefalinger til HP/NLFs faglige ledelse om umiddelbare tiltak

Dersom kommisjonen finner det nødvendig, bør anbefalinger meddeles HP/NLFs faglige ledelse på et meget tidlig tidspunkt. Dette kan for eksempel være:

- Midlertidig inndragning av elev-/flygebevis eller instruktørlisens.
- Modifikasjon/utbedring av utstyr.
- Midlertidig forbud mot bruk av tilsvarende utstyr.
- Midlertidig stenging av flysted.

11.7.4. Informasjon til presse og publikum

Det er viktig at presse og publikum gjøres oppmerksom på at ulykkeskommisjon er i arbeid.

Informasjon som gis skal komme fra kommisjonen eller fra HP/NLFs faglige ledelse.

Ulykkeskommisjonen skal ikke under noen omstendigheter frigi personopplysninger om involverte personer. Ved sterk pågang fra presse, henvises til deres egen "vær varsom plakat". Se for øvrig "Anbefalt handlingsplan ved ulykker."

11.7.5. Rapportering

Undersøkelseskommisjonen rapporterer til HP/NLFs faglige ledelse ved fagsjefen. Den faglige ledelse sørger for videre rapportering.

Rapportens form må tilpasses situasjonen, men bør inneholde kapitler om:

- Involverte personer.
- Flysted og forhold.
- Hendelsesforløp.
- Analyse av hendelsesforløp.
- Konklusjon om årsaken til hendelsen.
- Anbefaling overfor HP/NLFs faglige ledelse.

Norges Luftsportsforbund

Håndbok for hanggliding og paragliding
NHB-E

Appendix 5
Article
acro enters the world (in Swedish)

akro tågar in över världen

text: pernilla hammar rognøy

foto: pernilla o pål hammar rognøy

Akro, akro! Fick till SAT perfekt! Reverserade också för första gången! Det var rå grejer. Fick ett inslag på yttervingen pga lite dålig rytm, men reversal!!! Jaha!

Det här med att leka med skärmen är inte på något sätt nytt. Piloter med otrolig skärmkontroll som underhållit oss timmesvis på hang har alltid funnits. Jag törs påstå att Nicolas Hervy, Paraclub 2000, fortfarande är Sveriges okrönte kung i spinnlandningar och att få slå honom och Johnny Bergholtz på västkusthangen. Och det finns fler av dem därute. Men vad är det som skiljer dem från de som utövar akro idag. Egentligen inte stort. Det är bara att nu finns det ett namn för det, och en form runt det.

En vanlig dag i akroland

- C'est extraordinaire (se eksstrraorrrdinääärö)! vrålas ut i högtalarna vid Genève sjön och ut över närmare tjugo tusen åskådare till den fjärde deltävlingen av den inofficiella världscupen i akroflygning. Piloterna som landar på flotten ute i det svalkande vattnet applåderas som hjältar. Sen följer ärovarvet i båt framför folkmängden som uppmanas till en "applause orgasmique". Är det konstigt att akro är kul?

Under samma tävling mötte jag den tidigare franska landlagspiloten Sebastien Bourquin. Det var många år sedan han slutade med distanstävlingar, dels för att han hela tiden läxades upp för sina små waga turer på startplatsen före viktiga tävlingsomgångar, dels för att han inte längre fann någon glädje eller utmaning i att flyga långt. När jag frågade honom varför han tog upp tävlandet igen, men nu i form av akro, sa han med det största leendet; - För att det är jag. Akro är jag och äntligen finns det en gren där jag tävlar i det som är allt jag står för.

Från distans till akro

Akro världen har fram till nu mest bestått av mycket erfarna distanspiloter som har sökt efter fler sätt att utveckla sin flygning och på den vägen upptäckt akro. Bröderna Rodriguez, som anses vara världens bästa akropiloter just nu, har båda ett förflutet i det spanska landslaget och i Paragliding World Cup. Den schweiziska landslags- och testpiloten Andy Hediger, har även han switchat över till akro. Rob Whittall, Othar Lawrence och Olivier Nef, är andra stora namn som också de gärna syns i akrosammanhang. Och alla vet väl vad vår egen Peter Brinkeby kan prestera med skärmen. Så visst har akro blivit en gren att räkna med inom skärmflygvärlden. FAI jobbar för fullt med att få ett fungerande världsrankingsystem liknande det som finns för distanstävlingar idag, och fler arrangörer än det finns plats till, står och pockar på dörren till FAI för att få arrangera deltävlingar i nästa års akrovärldscup.

Akrokurs vs säkerhetskurs

Om man ser på intresset för de akrokurser som arrangeras runt om i Europa så törs jag påstå att akro intresserar fler än bara ett litet fåtal trötta distanspiloter. Landslag efter landslag skickar sina medlemmar på akrokurs med målet att få piloter med bättre skärmkontroll och bättre självförtroende. Piloter i början av sin distansflygkarriär tar en akrokurs innan de går vidare till säkerhetskurs, också de för att få bättre självförtroende.

Akro handlar om kontroll, att testa gränserna för vad skärmen klarar utan att den lämnar sin öppna form. Det satt i motsats till säkerhetskursövningar, där huvudpunkten ligger på att simulera problem där flygfarkosten inte längre fungerar för att sen få den att åter komma i flygande form. Båda övningsformerna leder till ökad skärmkontroll. Båda är lika viktiga på sitt sätt.

Slitage på skärmen

Det är rimligt att anta att skärmen slits mer per flugen timme akro än per flugen timme distans. Men du flyger inte heller samma mängd timmar akro som du flyger distans. Det har varit tal om ett visst antal timmar en skärm som används till akro ska tåla innan den är obrukbar, men den siffran är lika osäker som för vilken annan skärm och flygning som helst.

Du kan på skärmar som har använts till akro se ökat slitage på framförallt bärremmar som sträcker sig, bromslinor som sträcker sig på favoritsidan för SAT och a-linor som sträcker sig. Vilken som är den "svaga punkten" skiljer från fabrikant till fabrikant och det är alla problem som tillverkarna jobbar för fullt med att lösa. Att duken skulle skadas mer än vid vanlig termikflygning är ännu ej bevisat, men sannolikt blir den det.

De som håller på med akro är också mycket medvetna om att dessa slitage uppstår och håller därför vingen under kontroll fortlöpande, kanske till och med under bättre kontroll än många vanliga friflygpiloter. Dessutom märker en van akropilot ganska direkt om övningarna inte går att uppnå lika lätt eller på samma sätt som tidigare, allt signaler på att vingen behöver kontrolleras.

Tillbaka till ritbordet

Få tillverkar törs ännu gå ut och säga att deras skärmar är perfekt designade för akro. De ger hellre vingarna egenskaper som "mycket lekfull" eller de kallar den helt enkelt "den perfekta allroundern". Andra tillverkare, som Firebird, har tagit steget helt ut och producerat skärmen F-18 med den talande logon "acro" insydd i duken. Det tjeckiska företaget MacPara har gått ut med nyheten att de nästa år släpper tre akroskärmar; Intox Acro 22, Intox Acro 19 och MacEden II Acro 22. De allra flesta tillverkarna följer efter och har minst en akro-version av en populär DHV2 eller DHV2-3 vinge i test just nu. Till nästa år kommer säkerligen flera skärmar riktade mot akromarknaden.

De skärmar som används i tävlingar i akro idag är framförallt så kallade lekfulla standard DHV2 eller DHV2/3 skärmar, men för att de ska få den energin och den farten som krävs för optimalt genomförda övningar, måste de överlastas med 10-20 kg. Därmed uppför de sig inte heller som den klassade skärmen längre. Av den här anledningen så kräver arrangörer idag att varje pilot som deltar i en akrotävling har ett tillstånd från tillverkare, eller importör, som intygar att hon eller han har rätt att flyga denna skärm under dessa former.

Akro som tävlingsform

Akro är en bedömningsport. Tävlingen pågår under två till fyra dagar med olika programformer; fast program solo/syncro, annonserat program solo/syncro, fritt program solo/syncro. Fast program sätts upp av tävlingsledningen, annonserat program skrivs ner av den tävlande och lämnas in till domarna, fritt program är som en cat's cradle där piloten gör så många övningar hon/han vill och domaren har bara att hänga med och döma.

Ett begränsat antal piloter får möjlighet att delta i hela tävlingen. Och för att skilja agnarna från vetet inleds varje tävling med en obligatorisk kvalificeringsomgång där ett fast program måste följas. Det brukar vara relativt enkla övningar så det gäller att utföra dem så snyggt och rent som bara är möjligt annars riskerar du att missa "cut"en för att gå vidare. Du riskerar också att diskvalificeras om du visar dålig skärmkontroll. Ingen tävlingsarrangör vill ha olyckor och genom att låta piloterna visa vad de behärskar i en första hyfsat enkel omgång, så försvinner gärna de värsta vildsjälarna som hiver sig in i övningar de inte klarar av.

Tävlingen körs i en lottad ordning. Piloten startar och flyger mot den så kallade boxen där övningarna ska genomföras. Väl på plats ger piloten signal till domarna om att nu kör det igång, genom att lägga in öronen. Sen är det bara att följa programmet. En snyggt genomförd "enkel" övning ger mer poäng än en uselt genomförd avancerad. Nödskärmskast eller kraschlandning ger 0 poäng för omgången.

Domarna ger poäng i en tiogradig skala där tio är högsta möjliga poäng. Varje övning har en svårighetspoäng som läggs till det givna poänget. Det skiftar mellan antalet övningar som ingår under en omgång (ett run) från fyra till sex beroende på den höjd piloterna kan förväntas få över boxen. Alla poäng förs ner i ett schema där en del består av Tekniskt utförande - själva övningarna, Landning - stående på flotten, spiral, spinnlandning, touch av vatten, Koreografi - utnyttjandet av höjden, flyt/rytm/kopplingar, originalitet.

Akrotävlingarna är, liksom distanstävlingar, ganska så mansdominerade. Men vid några av årets deltävlingar i den inofficiella världscupen fanns det åtminstone två damer med, och tidigare år har det också funnits en eller två. Det är fortfarande lägre än de tio procent som är tilldelade plats i Paragliding World Cup, men det är en start. Här, liksom i distanstävlingarnas ungdom, sliter damerna med att vara lätta i skärmen och övningarna ser gärna lite tamare ut eftersom energin inte riktigt finns i vingen.

Sverige och akro

När nu akrotävlingar organiseras med FAIs välsignelse över hela världen så hänger svenska piloter efter. När våra grannar i väst valde att tillsätta en akrokommitté valde styrelsen i Svenska Skärmflygförbundet hellre att förbjuda grenen. När norska piloter fick klara riktlinjer för vad som ingår under akrobatisk flygning med skärm växte också miljön i rekordfart. Träffar anordnades över hela landet, med båt på vattnet, filmkamera och noggranna genomgångar av flygen.

Erfarenheter delades via diskussionsforum på internet och genom långa telefonsamtal. Allt visar på att det här var en miljö som redan fanns och som nu fick en chans att leva. Samma dolda miljö finns i Sverige, men här med ett förbud som lämnar piloterna till att träna för sig själva i det dolda och under okontrollerade former. Ett regelverk som skulle ha varit med i senaste revisionen av Föreskrifter och Definitioner har upparbetats av tävlingskommittéen, men när reglerna träder i kraft har jag i skrivande stund inte lyckats få något svar på. SSFF har i alla fall haft Norges regelverk till grund, så det borde påminna om det.

Akro är en tävlingsform där svenska piloter borde kunna ta sig till toppskiktet enklare än inom den traditionella distansflygningen där långa turer, gärna i hårda alpförhållanden, är det bästa sättet att träna. Vi har en mängd sjöar, vi har en mängd vinchar och vi har en hel hög lekfulla piloter. Klubbverksamheten finns redan på plats runt om i landet. Det gäller bara att bygga upp akroerfarenheten under kontrollerade former. Och sen om grenen utövas som träning för bättre skärmkontroll eller med målet att vinna ett framtida VM är irrelevant.

Framtidens guldget

Så är då akro skärmflygvärldens frälsning för att göra sporten mer välkänd och publikdragande? Ja, det är frågan. Helt klart är det lättare att få icke flygrelaterade sponsorer att ställa upp på arrangemangen än det är för distanstävlingar. Och visst är det lättare att locka media till att bevaka händelsen. Och visst når akrotävlingarna en större publik eftersom tävlingen hålls över ett vatten gärna i varmt väder och med öltält runtomkring. Men frågan är om publiken förstår något av det som händer där uppe i luften. Ett superstort inslag med fritt fall och kaos till följd imponerar möjligen mer än en perfekt genomförd helikopter. Och allt som sker där uppe i luften sker ganska lååååååångsamt jämfört med många andra flygfarkoster. Vi är ändå fortfarande luftens moped och det är fortfarande en liten sport vi håller på med. En sak är ändå säker - akro har breddat den sport som vi alla önskar fortsätta utvecklas i.

Appendix 6
Article
Spin or Spiral

Spin or Spiral?

By Bruce Goldsmith

One of the first lessons of Instability (SIV) is to understand the difference between spins and spirals. It is absolutely essential to understand the difference because the method of recovery from a spiral is exactly the opposite to recovery from a spin. Unfortunately most people do not understand the difference between the two and every time they see a glider turning quickly they call it a spin, when nearly always it is a spiral dive. How many times have you seen a report of a paragliding accident which starts 'one side of the glider collapsed and he immediately started to spin very fast towards the ground'. This is of course completely wrong, it must have been a spiral not a spin.

Spins are pilot induced. A glider will only spin if the pilot pulls one brake so hard that he stalls one wing (there is one other unlikely but possible way to spin a certified glider, that is to pull a B, C or D riser so hard that it could also stall a wing). The spin will continue as long as the pilot hold down the brake, and will recover as soon as he completely releases the brake. This is true during practically all types of manouvres, including collapses and cravates. Therefore our accident report above which said 'one side of the glider collapsed and he immediately started to spin very fast towards the ground', could only have in fact been a spin if the cause of the spin was the pilot and not the collapse! This is possible if the pilot caused the spin as an overreaction to the collapse, which does very often happen.

Spirals are completely different. In normal flight they are simply the extension of a steep turn that continues for several 360's. The pilot builds up speed as he is thrown out horizontally from the rotating glider which can be turning so fast that the leading edge can be pointing towards the ground. A collapse or cravate can also cause the glider to enter a spiral in a very similar way. The collapse causes drag which causes the glider to turn, and the turn will continue to increase in severity unless the pilot does something about it. It can be quite alarming the speed at which a spiral can start and increase. Spirals can become so severe that the g force can make a pilot black out if he does not stop it (unlike a spin where there is very little g force).

To stop a spiral, you must turn in the opposite way by applying the opposite brake. This is not as easy as it sounds, and if the spiral has already picked up speed you may need to use so much force that you have to use both hands on one brake to pull out of the spiral. Even if you stall the glider this is better than being locked into a spiral where your rate of descent can be in excess of 20m/sec.

The important thing to remember is that a spin is pilot induced and to get out of it you must completely release both brakes. A spiral is often caused by a collapse and to stop the rotation you need to counter the turn and pump out the deflation. So if we return to our accident report we can talk the pilot through the incident:

'one side of the glider collapsed and he immediately started to spin very fast towards the ground'

Initially lets say the left tip of the glider collapsed, and may even have got caught in the lines (a cravate). So the glider will quickly start to turn to the left. The glider is entering a spiral, so the pilot needs to counter the turn by pulling the right brake. This will stop the turn and return the glider hopefully to straight flight (depends on the size of cravate and type of glider). Just for the sadistic fun of it lets just say the pilot was to apply too much right brake. Then he might stall the right side of the glider and start a spin (the initial cravate would almost certainly come out, but he still needs to get out of the spin). The spin was caused by him applying too mauch brake and all he needs to do to stop the spin is to release the brake. When the glider recovers from the spin it will dive forward and may need braking to stop it diving too much.

This is one of the commonest cascade incidents I have heard of amoungst paraglider pilots and is also explained in detailed video footage on 'Instability'. Even though instability was filmed in 1992 the lessons outlined in it are just as important today.

Bruce Goldsmith

Appendix 7 Article

Cravatte – a serious danger on high wingovers (in Norwegian)

Opphenger - alvorlig fare ved høye wingover.

Av Karl Zlesak, DHV

Oversatt til norsk av Geir Dyvik, sept 2003

Nesten alltid når det skjer en innklapp ved wing-over, skjer det med den høye vingehalvdelen, dvs yttervingen. Det skyldes to årsaker. For det første er angrepsvinkelen liten, fordi hastigheten er stor og skjermen derfor mer utsatt for innklapp. Av den grunn må yttervingen bremses opp for å forhindre et innklapp. For det andre er stabiliteten av vingen i stor grad avhengig av at den holdes under belastning (vekt) og at det skjer for alle områder av vingen. Dette er tilfellet når "kurvevekten" (summen av pilotvekt og sentrifugalkraft) er lik over hele skjermen. I stasjonær svingflyving er det enkelt, mens i stadig vekslende svinger, som ved wingover, er det vanskelig.



Piloten må sørge for at svingevexlinger foregår på en slik måte at pendelsystemet av pilot og skjerm arbeider synkront. Når det ikke fungerer, for eksempel fordi kontrasvingingen settes inn for tidlig (eller for raskt), FØR man har det maksimale pendelutslaget, kan det bli farlig. I dette tilfellet skyter skjermdelen av pendelen fremover og har nådd sitt største utslag før det tilsvarende har skjedd med motstykket av pendelen som er vektdelen, nemlig piloten. Når skjermen har kommet på sitt høyeste punkt, blir den stående og nøle på grunn av den manglende energien (hastighet) og nikker så fremover på nesa fra topp-punktet. Nå skjer en avlastning og innklapp av den ytterste vingedelen. Innklappet skjer ikke som et innklapp ved normal flyving, forfra og diagonalt mot bakkanten av skjermen. I større grad faller nå vingetippen inn mot midten av skjermen og henger seg ofte opp i linene fra den delen av skjermen som fremdeles er åpen. Fra denne opphengersituasjonen går det direkte over i en stupspiral. Piloter som har opplevd en slik ekstremsituasjon, glemmer aldri med hvilken brutal dynamikk skjermen fikk en slik forrykende stupspiral i løpet av få sekunder.

Ved første øyekast er det ikke åpenbart hvorfor skjermen gikk så raskt inn i stupspiral fra denne situasjonen. Forklaringen ligger igjen i pendelsystemet pilot-skjerm. Etter at skjermen har klappet inn og vingetippen har hengt seg opp i linene, oppstår det et dreiemoment til denne siden mens piloten svinger mot andre siden. Etter ett til to sekunder er pendelen i fullt utslag som ved wingover, med den forskjell at luftmotstanden i den opphengte vingetippen forårsaker en rask inngang til stupspiral.

Forsøk på å bringe stupspiralen under kontroll (kontrastyring, fullkolaps) er nesten umulig. Ofte kan piloten ikke gjøre noe fordi det har oppstått tvinn på raiserene. I denne situasjonen må man være rask og kaste nødskjermen.

DHV anbefaler at man kun øver wingover over vann, med alle tilgjengelige sikkerhetsforanstaltninger. Over land må wingover betraktes som en spesielt kritisk flymanøver, særlig i lav høyde, på grunn av de voldsomme konsekvenser av en pilotfeil. Dette gjelder også med spesielt sikre paraglidere (DHV-klassifisering 1) som i ulykkestilfellet beskrevet under. Skjermoppførselen som er beskrevet kan skje med paraglidere av alle klassifiseringer. Denne type flyving omfattes ikke av DHV typegodkjenningstestene.

Nytt dødsfall ved "acroflyving":

6. september 2003 omkom en 23 årig tysk pilot med 3 års flyerfaring i Syd-Tirol. Ifølge øyenvitner øvde han på svært høye wing-over i mindre enn 100 meters høyde over bakken da han fikk avlastning av linene og et stort innklapp. Innklappet hengt seg opp i linene og piloten gikk inn i en stupspiral som piloten ikke klarte å stoppe. Nødskjermen ble ikke kastet. Piloten døde av skadene han fikk da han traff bakken i bratt terreng. Piloten fløy en UP Pulse, klassifisert i DHV 1.