

« How To Survive Gliding ? »

About Me

I am 44 years old (we are writing the year 2008), and I have been flying gliders for 28 years. During this time, I have spent some 2'200 hours in three dozen different gliders with wingspans ranging from 10 to 29 meters, and I've run about 70'000 km cross-country. I earned my German instructor's licence 20 years ago, and since two years I also fly as an instructor with my local Swiss club. I regularly train aerobatics on the club's ASK21 – without much higher ambition; I just love to fly rolls.

Most of my airtime (about 1'700 h) I spent in the Alps, and I own a Ventus cM. Over the last 10 years, I managed to average about 130 h per year.



Motivation

In, 1996 Southern France claimed a death toll of 18 amongst glider pilots – three of them dying at my airfield, when the training two-seater inadvertently spun into a single seater below it. At that point, I stopped gliding for a year in order to think about my own ranking on the list. Eventually I came to the conclusion that – midairs set apart – it solely depends on me if I want to wreck a glider. I then decided to keep on gliding and bought my first glider (well, a share in a glider).

Ten years and 1'300 h later I can't help to state that the number of accidents is certainly varying from year to year, but on average it always stays the same. Why is this? Is there anything we can do about it?

Do I have a chance to escape from the statistics on the long run?

For me, gliding means to get to know new landscapes, to widen my experience. I'm constantly reaching my limits, and if I want to learn something new, I have to push these limits – on each flight, I somewhere have to cross the limit at least a little bit: the next mountain pass, the next mountain range, or the known ranges a little lower and a bit faster. I need to get beyond the limits in my head, but I mustn't cross the limits of aviation!

I certainly have no easy solution to present how to avoid all those dead fellow pilots. I actually think that there is no easy solution at all – but may be it does help to speak out my thoughts.

Each time there is an accumulation of lethal accidents – which is about every summer – the pressure from third parties increases. Local or even national newspapers report, they point to the number of accidents (or impacts in residential areas), and subsequently politicians and the like feel the pressure “to do something”.

Which will come along as “preliminary” rules and restrictions with the remark that we'll have to wait for the accident investigation to conclude on causes.

Reading the investigation reports of the last years, one finds thorough explanations how the accident happened and why it was impossible to survive the impact.

So, what do I learn from this?

When a glider runs along with 110 kph below a ridge and sticks its wingtip slightly into a rock, I don't need much of an imagination that the pilot doesn't stand any chance.

If a pilot turns into final for an outlanding, stalling his glider less than 100 meters above ground – how would he possibly survive?

The investigation report will tell me very precisely, how the accident did happen – but not much else. It probably will tell me

something about the poor pilot's overall experience, and his level of training. But honestly, I shouldn't expect much more even from the most conclusive report.

But what I want to know is: *Why* did this accident happen? It's not like most of the accidents happen to low-hours pilots and youngsters. On the contrary, most often the victims are pilots with thousands of hours and accomplishments I dearly would like to get to.

Why a Klaus Holighaus didn't return from the mountains?

Why was a Hans Glöckl been had?

Why did a Wolfgang Lengauer crash into the ridge?

Why is Frederico Blatter gone?

Why does an experienced pilot spin into the ground during an outlanding?

How can I avoid to follow them?

If it hits so many experienced pilots, and if I'm piling up more and more experience – how not to be killed by my experience?!

Accidents

Aviation is built on redundancy so that a single error doesn't turn into disaster. If a mechanical link to the aileron has failed, the daily check will make it evident and the glider is grounded – but if we skip that daily check, we make an error on top of the defect, and that gives way to an accident.

Avoiding accidents therefore means breaking the chain of errors. Obviously, we also could try not to make errors in the first place – but I personally haven't yet met the pilot who doesn't make errors.

Now, what are these errors? "Error" is probably not the right word, "accident factor" seems more appropriate to me.

Accident factors can be classified into several groups:

1. Technical Defaults

Here we find structural failures, or problems like failure of instrumentation due to clogged pressure ports.



2. Piloting Errors

These are badly executed manoeuvres, as erroneous planning of the pattern circuit, stalling on final etc.

3. Stress Overload

We can be overloaded by ending up in a messy situation (struggling to stay aloft over unlandable terrain, low-level rope break on aerotow), or simply by the fact that our personal performance has deteriorated by lack of oxygen, dehydration, tiredness or an urgent need to pee. But a pilot is also overloaded if he has to identify another glider heading for collision with more than 300 kph relative, when the background contrast is high.

4. Erroneous Situational Judgement

Here, things are getting a little bit fuzzy... To judge a situation, we have to take into account the weather, the terrain, our flight experience, our actual level of training, our daily psychological state - everything.

Error chains are typically made of accident factors from more than one of these groups:

Initially, we are happily cruising and don't worry too much about outlanding sites – things look rather ok. Then the situation becomes a little stressful because that next thermal just doesn't want to show up, and

the situation with fields is not exactly what we thought it was. Workload gets high and higher and we finally don't even recognise the piloting error on turning into final – until impact.

About twenty years ago I had a near-miss after which I started to think intensively about my behaviour in a cockpit:

After releasing from a winch launch on a day without thermals, I was doing 60 degree bank turns in a glider of 26 meter wingspan. Somewhere around 250 meter AGL the nose gently started dropping, and the glider just wouldn't react anymore. The standard procedure to stop a spin showed no result (the rudder was sucked into the direction of the spin, and I was pushing the pedal towards a force-limit, instead of pushing it to the mechanical stop). After a short review of the situation (including a hopeless glimpse at the canopy jettison handle), I pushed the rudder out of the shoulder to the stop, jerked the flap lever to negative and started to pull up as soon as my bum signalled seat pressure. By this time I had done one and a half spin revolutions, and the pull-up was well beyond any limit for v_{ne} or max g-load, just to stay clear of the tree tops.

Looking back, I had worked myself through every possible part of the error chain:

- It was the time of my diploma exams and I had a fairly poor level of training – but I wasn't aware that my performance was badly affected by that.
- I didn't thought about the fact that stalling during a high-bank turn might turn even a docile ship into a beast, and that an open class ship with its huge angular momentum takes some more time to stop a spin.
- I didn't fancy that the altitude after a winch launch only offers a quite limited reserve AGL for a spin experience.
- I finally did a very common piloting error by stalling the ship.

The only reason why I had succeeded to break the error chain was that over the past, I had developed the habit to train

spins (at high altitude) with almost any glider I ever flew.

But the fact that I did make it in the end was basically luck (obviously, I didn't have any plan B). That day I decided that my survival mustn't merely rely on a little luck.

In order to **break the error chain**, we have to think about how to avoid or neutralize the „accident factors“ of any of the above groups.

Technical defaults and piloting errors are „hard factors“; they can be assessed objectively. Since soaring has been around since quite a couple of decades, one can say that these factors can be relatively well kept at bay through official rules and legislation (training syllabus, airworthiness requirements etc.).



Stress overload and erroneous judgements are „soft“ accident factors – it depends on the very pilot which stress load he will stand, or why he misjudges a critical situation. And as it depends on the pilot, *there can be no strict rules to hide behind*. Every pilots needs to know his own limits, and he can't discharge responsibility!

I am convinced that the starting points of most accidents are soft factors. The error chain then adds a hard factor or two – stalling on turn to final – to make the perfect crash.

And as these soft factors can't be fought by general rules and legislation, they are difficult to grasp – and in the world of soaring, there is no tradition to discuss

them in a structured manner. Professional aviation is light-years ahead of us in this point.

Of course – professional aviation deals with other levels of workload and responsibility...

Well, does it? In terms of responsibility, certainly so. There are no 300 pax in my Ventus choosing between chicken and pasta while trusting the pilot.

On the workload level, I'm not quite that sure. On an eight-hours cross-country flight through the Alps, I have to make strategic and tactical decisions by the minute, I have to fly the glider precisely (i.e. low on a ridge), I have to deal with lots of radiation from the sun and have to worry about getting enough oxygen to breathe. There is no autopilot or copilot I could count on.

I'm convinced that high-performance flights in gliders put a huge workload on the pilot, and that those soft factors are being systematically underestimated and pushed away. It's about time to grow up a little in this aspect.

Stress Overload

A stress overload always happens when our performance doesn't match a given task. That may be the case because a task is very or even too difficult, or because our performance has decreased for various reasons. In any case, it is a „soft“ factor as it strongly depends on the situation and on the pilot's personality.

What can we do about this? We have three choices:

- We can make sure that our performance doesn't decrease.
- We can make use of „pre-defined“ solutions.
- We can avoid situations which might push us beyond our limits.

Obviously, the best would be a combination of all three.

Performance can already be maintained by technical means:

The human eye is not at all trained to identify an aircraft bound for collision. That aircraft doesn't move relative to our field of view – but genetically, we are hunters and our image processing is optimized for movement detection. The identification of a still object 30 degrees off our nose is just not part of our “specification sheet”.

We can help our mark-1 eyeballs by using an anti-collision system as Flarm, by giving our glider's appearance a little contrast, and by supplying the brain with enough oxygen for image processing. As aerobatic pilots know well, image processing is the first thing shut down by the brain if there is a lack of oxygen.



Another tool which helped to reduce my personal workload enormously, is the GPS in alpine soaring. Without a GPS, going to a new mountain range gives a lot of work with map and rule in order to decide which outlanding field is within reach, and when I can't jump into the next cone anymore. If one gets low, one also needs to find lift on those unknown ridges, and if the ridges don't work, the workload gets real high.

Since my GPS offers me the bearing and distance to the next field with a simple glance, my beats-per-minute have significantly decreased in such situations. Obviously, the maps and the rule are still in my side pocket, but most of the time I can just concentrate on the lift. And instead of having my

nose in the map for long moments, I even can watch out for other gliders.

A helpful tool can also be a stall warning (i.e. the side string on the canopy). If a pilot spins in during the final turn for an outlanding, his normal input channels to detect a stalled attitude must have been clogged – which is also a form of overload



And of course we have to pay attention to the biological base of our performance:

If we fly for hours and hours, we have to eat, drink and pee – just as we do on the ground. If we sit for hours in the sun or the cold, we have to be protected. And flying in the mountains, we have to be aware how oxygen depletion affects our performance.

All these factors do tire us gradually, and we have to have a plan to fight them back. If I'm hungry, my blood sugar level is already too low, and when I'm thirsty, I am already dehydrated. And when I get the feeling that the air is getting thinner, the canula should have been up my nose since quite some time. Well, and everybody knows that bladder pressure is highest when we happen to be low down on the ridge...

All these factors play a role whether I will reach my limits during a hairy situation on this flight. And for this situation I should have made sure that I have the best prerequisites – a little less might

just be the difference between a deep sigh, or dangling on a winch rope underneath a helicopter.

An important tool to escape from a difficult situation is the **mental preparation** – like considering a break of the tow rope while preparing for launch. Calling out „safety altitude“ during aerotow means that I know exactly what to do in case the tug lets me down, and that I just execute a pre-drilled manoeuvre.

A good example is Valentin Mäder's classification of a situation during cross country into the categories Green, Orange and Red. As long as the situation is „Green“, average speed is all which matters. As soon as the situation becomes „Orange“, the focus is on staying airborne, and during „Red“ the only task is a safe outlanding. By consequently „declaring the situation“, any doubts are dismissed and the actions are well defined – deviation from the track, accepting weak lift, dumping the water etc.

Stress-Lock

Sometimes a sharp decrease in performance may happen exactly when we need it the least: One locks up under stress – a little like the rabbit which get hypnotized by the snake.

There is a fair number of investigations into this subject (mostly from the defence industry), and the findings can be wrapped up as follows:

When we suddenly identify a situation as being life-threatening, our body sets free a massive dose of adrenaline. If this dose is too high, our basic motoric functions are pushed to their max (to make us escape that evil lion hunting for us), but our fine motorics and our perception are drastically reduced – with tunnel sight and selective hearing, we loose the best part of our connection to the world around us. There is just no way anymore to judge the situation correctly and to act accordingly. Once such a reaction has taken place, there is absolutely no way to control it, and when this happens in

a cockpit, the outcome is dramatic: the glider stalls on turning into final, everything spins around and we try until impact to pull up the nose.

Is there anything we can do about this?

Well, the simplest and best solution would be to avoid this type of situation – some words on this below.

The only alternative is to make sure that there are no massive doses of adrenaline. Some situations can't or shouldn't be trained, and it is important to go through a mental preparation with pre-defined actions schemes. If during a flight we see that the situation glitches towards drama, we then can take out the pre-defined action of the mental drawer and execute it even under stress.

However, there are critical situations which can be trained and drilled very conveniently – if one only wants to. Spins are a very good example: A pilot who has seen just half or one rotation during his initial training will be heavily disoriented when ten years later the sky turns green and keeps spinning around. It's no big deal to do a little spin training at a safe altitude once or twice a year, together with an instructor if necessary. It will not be any guarantee that we never will spin a glider unintentionally – but if we do, stall, departure and even a stationary spin will be something we are used to, and our body will probably not push a dose of adrenaline into our veins which shuts off the better parts of our brains. Sometimes it just needs a second or two for the right reaction, and life goes on!

My near-miss described earlier is a good example: Having done spin training on various gliders over years did save my life, because the animal part of my brain didn't take the strange attitude of the glider as life-threatening, thus giving me the chance to think.

Tow rope breaks around safety altitude on aerotow are another example –

having done most of my launches on a winch, a low rope break on aerotow used to be a nightmare for me. Now that I fly as an instructor in a club which exclusively aerotows, I have to fly these exercises on a regular basis (and have to prepare them mentally) – they are actually an excellent example for pre-defined action schemes.

Each pilot has his own personal limits, and we just have to understand that often these limits are much closer than we would like to think.



How do we avoid situations, which push us beyond our limits? The first and most important step is to judge the situation and its potential development correctly. I am absolutely convinced that most heavy accidents originate at this point.

Erroneous Situational Judgement

Correct judgement of a situation requires knowing one's own limits – or even accepting the existence of personal limits in the first place, even though our "top gun image" might take a blow.

It is important to be aware that these limits shift from day to day, and even throughout a single flight: Working the ridge after takeoff is a different story than ten hours later, when we scratch together the last couple of meters to finally make it home.

If at the beginning of the season I spiral in a thermal just below and in front of the ridge, I might spend a

thought or two on the fact that I just finished hibernation and I don't exactly have the same level of training as I had last autumn after logging 150 hours during the season.

There are no rules or legislations to help us on that – we have to judge by ourselves. Lying to oneself means having one leg in the tomb. During spiralling underneath a ridge I personally put myself upon *each* turn the question whether I think survival of the next turn is a realistic scenario – and on quite a couple of occasions, the answer is “no”.

But even knowing the own limits one can perfectly have a judgement of a situation which is plain wrong. On a competition flight, I once went up the eastern side of the Durance valley from St Crepin to the turnpoint Briançon and back – with the north-westerly wind on that day a piece of cake to run low and fast. Unfortunately, the wind happened to be just strong enough so that this part of the valley was in the lee of the high Ecrins massif, and when I finally made back to St Crepin uncomfortably low, my neck had grown by a couple of inches.



In order to judge a situation correctly, it takes experience, and experience is actually the sum of all *wrong* judgements. Unfortunately, glider pilots can't really escape this mechanism – and it is also just part of the game to sometimes sit for hours in a field

swearing and trying to figure out, how one ended up here.

The lesson simply is that I have to accept that my judgement may be wrong. The basic rule is „*Always have an alternate.*“

If the thermals don't do what they are supposed to do, my “alternate” is a field within reach. But I have to know this field and be able to recall it *before* I get into the situation to need it! If my judgement is that the ridge will work, and I look for something landable only once the ridge has had its laugh at me, I'll be under stress – and I only can react instead of act. *I need at least one answer for every potential development of a situation.*

If I'm running the ridge low above the trees, or if I thermal just above the ridge line – I have to have my escape route at any point of time – that can be the lee side of the ridge, or just my excess speed. If I haven't thought about escape and hit the downdraft of the thermal close to the trees – well, then there will be just no escape. It's just like crossing a mountain pass – you always approach under an angle and have the speed to abort..

The principle is always the same – I have to plan for the possibility and the ways a situation might degrade, and I have to be at least one step ahead of this degradation. If I don't pay attention to this principle, I'll be limping behind, and eventually I won't be limping fast enough. *Always be ahead of your aircraft.*

Sometimes there is a „gutt feeling“ that something is wrong with the situation. There is no real grasp on this, every single point looks ok, but it just feels not ok. As a trained physicist, I used to discard gutt feeling and called them Voodoo – there is little place for esoterics in the world of physics. However, I have come to learn to listen to gutt feeling, and even to take it seriously. There have been days with

good weather, a glider waiting for me and the whole day at my disposal. But something didn't feel right and I told myself: Just forget it, go do something else. And I did. I still don't know whether I should have been flying on these days, but then even I don't need to know this – there will be enough other days to go flying.

Error Recognition

Stupid men always commit the same errors – intelligent men always invent new errors.

Every pilot commits errors – we are humans, not machines. If we want to break the error chain, we have to organize or flying in a way that one single error won't lead to an accident. The planning for alternates is an important tool for this.

But if we want to evolve, probably the most important means is to recognize the errors we have made, and to eventually learn from them.

That means being honest to oneself in the first place, and to be open for critics. If during a flight things didn't work out as expected, flying low did turn into flying real low, acceptable fields are nowhere to be seen and the adrenaline level rises... und puh, there is the lift and operations switch to "normal" again.

Then it is absolutely important not to push away the event, but to mentally go through that situation again – maybe once we are back home – and to analyze how we did end up with cold sweat on our face. Of course it would be much more appealing to tell the buddies over a beer how close that call was and how our exceptional flying skills finally made it work out. But that means pushing away and lying to ourselves. It is much more worth to admit that that event was no good, and that would be better off avoiding it the next time.

Stupid men always commit the same errors...

The recognition of errors also requires to listen to critics from the outside. An

experienced pilot, an instructor and sometimes even a student pilot looks at our behaviour from the outside, and when he thinks he sees something strange – well, we should be listening first and then think about it before snapping „Shut up, bimbo“. Maybe he ain't no bimbo.



Collective Treatment of Errors

People say that there are ten near-misses for every fatal accident. Those who had the fatal accidents are no more there to tell us which error chains finally killed them. The investigation report certainly will tell us that spinning in nearly vertically unfortunately didn't leave a chance for survival. But *why* did this pilot with a couple of thousand hours under his belt stall his glider? What let him to commit a piloting error and to not even be aware of it? He won't tell us – he's bloody dead.

But for him, there have been ten near-misses where the accident has been avoided by breaking the error chain. These pilots *can* explain us how the error chain was built up, and how they eventually managed to break it. We all could learn a lot from this experience if those pilots would be ready – and be allowed - to talk about it frankly and honestly!

Near-misses are a huge pool of experience, and we are actually in no position to discard it. However, it is important that pilots can easily and without any disciplinary consequences talk about their critical situations – the

internet provides us a fantastic tool for this.



Constructive dealing with errors is a crucial point which absolutely needs to be incorporated into the culture of gliding.

According to our traditions, errors are to be punished and will have „consequences“. Piloting errors should of course have the consequence of some more training, and there is very little place in aviation for any lack of discipline.

But there are lot of occasions to commit errors on the basis of “best knowledge and conscience”. If we get away with it and are aware of having been stupid, then we could at least try and have our buddies profit from that experience as well.

This will only work if the soaring community promotes an open discussion about these errors. Maybe our image of being cool pilots will take a little blow – but honestly, the photo of a pathetic heap of scrubbed plastic is certainly not something which conveys an image of coolness, either.

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