PHOTO: Brett B. Despain

Fly the Dog

by Captain Pat BOONE

Pilot errors from a pilot perspective

While aircraft systems have become more reliable over time, pilot human behavior becomes the most critical factor affecting aviation safety today. Simulator training often focuses on flying skills and the correct execution of emergency checklists and standard operating procedures (SOPs). However, statistics show that aircraft accidents seldom involve typical simulator trained failures. Should we focus on something else ?

Engine failure, loss of all electric generators or cabin decompression rarely result in fatal accidents, although the latter one can be overwhelming. An inextinguishable engine fire is not a life-threatening event, despite scare stories that the wing drops off if the engine burns for 10 minutes or more. A recent wing fire on a Singaporean triple-7 proves the opposite. All-engine flameout due to heavy rain, ice crystals or volcanic ash have occurred in real life, but has never led to a fatal crash in the past few decades.

I would even go as far as to say that none of the failures instructed in the simulator, if they are managed correctly with an appropriate flight crew response, ever compromise the aircraft to the extent of a fatal crash, except for the following:

- Jammed or restricted flight controls: Your aircraft is not responding to control wheel inputs, or a flight control is jammed fully deflected. I recommend to try to regain control through flight controls and engine secondary effects.

- Unreliable flight instruments: Airspeed, altimeter or attitude indicators showing confusing or even contradictory values, for example overspeed and stall warning go off simultaneously. My advice is to freeze the aircraft attitude for a few seconds until both pilots determine which indicator is working correctly.

- Cabin fire: Any fire starting inside the fuselage can destroy the aircraft in only a few minutes. Videos on the internet show flames coming out the aircraft ceiling only minutes after the fire ignited. My advice is to initiate an immediate descent and consider an off-field landing as soon as the cabin crew reports flame height exceeding 1 meter / 3 feet, even when crossing 40 west over the Atlantic.

This doesn't mean simulator training is useless. On the contrary you need to practice those skills in order to fly the aircraft safely. However, simulator training should not solely focus on type-rating requirements.

In fact, if you double or triple the simulator hours, almost anyone, including your mother in law, can fly an ILS without any previous flying experience.

"Flying a perfect ILS does not make you a safe pilot."

So, why are we still crashing airplanes? Why do aircraft in perfect condition continue to skid off the runway every month? It's no secret that 6 out of 10 accidents are caused by pilot error, of which nearly half during landing. Flying an ILS with perfect precision does not make you a safe pilot. It's not pilot skills, but people skills that make the difference between an ordinary pilot and a safe pilot. Becoming a safe pilot should be your ultimate goal.

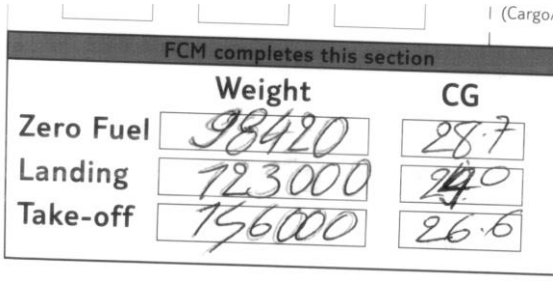
While pilot error can never be eradicated, there are two areas in which I believe, from a pilot perspective, it is possible to make the difference and become safer pilots. These areas are *self-discipline* and *Cockpit Resource Management (CRM)*.

Self-discipline

Besides *flying skills* and *sound judgment*, self-discipline is the third keystone of good airmanship. Unfortunately, there are several occasions where safety can be jeopardized, even by experienced pilots, due to lack of self-discipline. It can be something as simple as poor handwriting.

Handwriting

It may sound pedantic that I refer back to what you were taught many years ago, but some pilot's handwriting is similar to that of doctors. Illegible handwriting compromises flight safety!



Is takeoff weight 146.000 or 156.000 kg?
Is CG for landing 24.0 or 29.0 units?

Multiple times a year the loadsheet comes in with invalid weights simply because the initial numbers prepared by the flight crew were unreadable.

Last year the airline had an in-flight engine shutdown due to poor handwriting. An excessive fuel imbalance noticed on takeoff was interpreted as a major fuel leak because of an unclear remaining fuel entry in the Tech Log by the previous crew.

Keep in mind that fellow pilots and ground personal may come from other cultures using different alphabets. Simple numbers may be interpreted incorrectly when your handwriting is not clear.

It requires extra effort and self-discipline to write clearly. I strongly recommend to use unambiguous handwriting whenever you take down the weather, prepare the loadsheet, order fuel or calculate aircraft performance.

Use of checklists

It is very unusual for pilots to deliberately skip the checklist. On long taxi routes to a distant takeoff runway there is an increased risk that the crew gets distracted by non-operational chitchat and consequently an increased risk of forgetting the before takeoff checklist.

However, even more important is the way the checklist is completed. If you read and reply to checklist items without looking at the switches, it reduces the effectiveness of the checklist to nothing! I am surprised by the normal checklists of a major manufacturer where the first-officer does the overhead panel setup, he or she reads the checklist items and then responds to the items him or herself. The typical verbal challenge and response crosscheck is completely wiped out here. It takes an enormous level of self-discipline for the captain to concentrate and actively follow the checklist and not be distracted by ground personal calling the flight deck, by cabin crew reporting boarding issues or by any other source…

My advice to co-pilots is to monitor your captain while you read the checklist. If you notice any inattentiveness, simply stop the checklist until your silence wakes up the old man and he returns focus. Unfortunately, I notice that most co-pilots simply continue the checklist when I grasp my cell phone for an incoming text message…

Reading checklists, up to 30 times on a commuter pilot working day, is a routine task and therefore increases the risk that the checklist is accomplished without the pilots attentively verifying switch position and flight deck indications. Pilots onboard a Spanish MD-82 verbally confirmed flaps set for takeoff while reading the checklist. A few minutes later the aircraft crashed on departure with the flaps up.

The Spanish MD-82 crashed on takeoff with flaps not selected

Standard Operating Procedures

Standard operating procedures (SOPs) are different for each airline and often change when training staff are renewed. Pilots changing company every season may also have a hard time applying the new SOPs.

SOPs distribute tasks between two pilots on a multi-crew flight deck. Each pilot knows what button to press and what call-out is to be given or is expected. SOPs make two cogwheels turn in sequence and guarantee that all flight deck tasks are done in a methodical way. But that's not all.

SOPs may look weird and it may sometimes be difficult to understand the thinking that went behind the creation of a particular SOP in the first place. Often SOPs were created in retrospect to prevent pilot errors that have led to fatal accidents. A few years ago, all crew members and passengers on a Cypriot 737 aircraft lost consciousness as the aircraft climbed with the cabin unpressurized. The aircraft continued on autopilot and crashed one hour later after running out of fuel.

Sometime later, several companies updated their SOPs by including an extra check on the pressurization system during initial climb.

Therefore, even if you do not always understand or agree with a company SOPs, you should always adhere to these procedures. Again this requires self-discipline day-in day-out.

Switching and monitoring

Here we go again. You know how to turn on the radio since you were 2 years old.

Nevertheless, in many aircraft accidents, switching appeared to be the cause of the accident. The crew *believed* to have switched the system ON or to have engaged the autopilot in the required mode, but the switch was never placed into the correct position or the system failed to respond correctly when the switch was selected.

Let's review basic switching in slow motion by breaking it down into 4 steps;

- Step 1: Take the correct switch – switches on the flight deck look alike and there is the risk of selecting the wrong switch. You would not be the first 737 pilot to breakout of cloud and turn-off hydraulic system B instead of engine anti-ice. A few years ago a co-pilot rolled the airplane in a 130 degrees bank angle by rotating the rudder trim instead of the door unlock.

- Step 2: Prior to moving the switch, query yourself on system indications you expect to see – that's easy when you select the autobrakes for landing. But how about duct pressure when you select the air-conditioning from NORMAL to HIGH flow mode? Do you expect duct pressure to remain unchanged, drop or increase? Did you know there are 8 (!) indications on a typical Boeing flight deck when you select engine anti-ice to ON, which I am sure you did hundreds of times by now. Do you know what they are?

- Step 3: Move the switch into the correct position – this comment is especially true for pilots flying multiple aircraft models or variants and for new factory delivered aircraft where identical switches may have different selections.

- Step 4: Monitor the actions that you listed in step 2 – positively verify all lights and indicators display as expected.

The Hydraulic Pump switches can be mistaken for Engine Anti-Ice switches

Now, which step is the most difficult one? For pilots new on aircraft type, step 2 is probably the difficult one. Sad to say, some pilots with years of experience on aircraft type appear also unable to list flight deck responses to switch selection.

However, for experienced pilots step 4 is the stumbling block. Flying the same aircraft model for 25 years now, I have selected every switch on the flight deck some 25,000 times. Can you imagine how much self-discipline it requires from me to look at that light as if it's my first time seeing it come on? It is awfully boring to look at that panel day-after-day to ensure the system is responding

as expected! That early morning, when you are still drowsy after too little sleep, the system or autopilot does not respond to your switching and you do not notice it. These are the errors that kill you! The day you believe the system never fails, because it has worked for years, is the day you crash!

"The day you believe the system never fails, is the day you crash!"

A Turkish 737 crashed during approach into Amsterdam with the autothrottle system switched ON. Despite an additional safety pilot on the flight deck, the autothrottle system was left unmonitored by the crew and failed that day… The same system was left unmonitored in the Korean 777 accident at San Francisco where the autothrottle went into an unexpected HOLD mode instead of SPEED mode. In many accident reports you read that system behavior or malfunction was clearly indicated on the flight deck, but both pilots failed to notice it!

Know the books

There was a time when I questioned trainees about terrain heights as shown on the map display. Do you know the values indicated by green-amber-red ?

Astonishingly 9 out of 10 pilots could not answer my question. Answers varied from *"green is euh… I think minus 2000 feet, or… was it minus 500 feet, euh, don't remember"* to *"it's 4000 feet for sure, I did my line check last week, sure"* to *"what a stupid question"*. None of those was the correct answer.

The same green-amber-red color question could also be asked for N1 engine display.

Some pilots felt offended by my questioning, so I stopped asking.

Typical map display with terrain relative height indicated with different colors green-amber-red

Imagine you are hospitalized for surgery and you are laying on the operating table. The doctor is about open you up with a brand new laser gizmo. But when you ask him about the green-amber-red lights on his new toy, he goes like *"euh, minus 2000, or, was it plus 500, euh, don't remember…"* I'm pretty sure you stand-up and you run for your life.

Each aircraft accident involves a double investigation. The first one is the technical investigation where investigators try to find the cause of the accident, such as human error or a technical malfunction. The report contains recommendations to the airline training department, to Air Traffic Control, the aircraft manufacturer and to anyone else in the chain of events.

But there is a second parallel investigation, never shown on television… The juridical investigation; who's responsible and who is going to pay? Payments for surviving relatives and medical care for injured passengers are expensive and somebody has to be held accountable. Don't worry, even in the case of pilot error, you will not have to pay yourself – your company's insurance covers that. But, as a pilot and a human being, you may be held responsible.

So, there is that 12-men jury, sitting in front of you. Some of them are not pilots, they cannot tell the difference between a B707 and an A380, both have two wings and four engines.

But they do know the difference between green-amber-red simply because they have the books open in front of them. And they will tell you *"dear pilot, on page 872 it says; green-amber-red is… And you did not know that?"* After which, depending on the country where you happen to live, you may get convicted of negligent manslaughter.

As a pilot, your career is over. But also as a human being, your life is over. In a way of speaking, of every ten pilots surviving an aircraft accident, two commit suicide because they cannot live with the thought of being held responsible for the death of passengers or fellow crew, two end up in a mental hospital for the same reasons, two find themselves in a wheelchair, two end up in prison and the last two lose their jobs. It is very seldom that a pilot continues flying after surviving an accident with injuries that is tagged *Pilot Error*… From heaven to hell in a split second.

Do you want your career and life (and that of many others) to end just because you didn't know the numbers? Make sure you always know the books. Trainees that passed their theoretical exams a few weeks ago have already forgotten a substantial part of the theoretical stuff. After all, we are humans, not computers, and there are tons of papers to be learned. Therefore, make sure you review the books on a regular basis. With a busy social life, this requires a lot of self-discipline. Don't wait until your next simulator check ride. That is only an expensive game toy. The real check ride is *today* and tomorrow, with real aircraft and real passengers!

As a side note, airline companies should transition from a blaming culture to a work climate of understanding. Internal safety investigations must focus on human factors that contributed to the incident rather than assaulting and accusing pilot error. This new culture returns more valuable feedback for the company and the aviation community.

Reference values

Can you instantly recall – and thus verify – engine fuel flow on takeoff? Do you have any clue how hydraulic quantity varies during taxi, takeoff, climb and cruise? Many pilots cannot answer these questions, simply because they are not interested in this stuff. These numbers are not in the book, but they are displayed on the flight deck every day…

It makes me sad to see a crew during engine start in the simulator blowing-up the engine beyond maximum exhaust gas temperature (EGT), while fuel flow was clearly out of limits for the past five seconds. You can shutdown that engine at 200 degrees instead of 200 degrees above maximum EGT simply by recognizing unusual fuel flows.

Are the indications normal for the phase of flight?

It is also disappointing me when a captain with over ten years experience on aircraft type cannot tell me what amperage and voltage is usually shown in the cruise for the electrical generator. If you love your airplane, you get to know the reference values for all indicators on the flight deck.

Imagine you have a special day to celebrate, but your partner says "*Sorry honey, not tonight, I think I have a fever*". You don't take 'No' for an answer, so you grasp the thermometer, you measure body temperature and it says 40°C. Party or no party tonight?

I suggest you first test the thermometer on yourself. If it shows 37°C, an instrument error is excluded. Next, take your partner's temperature again to eliminate a faulty measurement. It now shows 41°C. Time to call a doctor?

Why should you? Is there something wrong with this temperature? You are not a doctor, so how can you interpret these numbers?

The answer is simple; because you know the reference value. You know that 37°C is normal and therefor 40°C is too high. You don't have to become a *nerd* and know that your body temperature may drop down as low as 35.5°C during a 6 hour sleep, or that temperature taken under the tongue is showing between 0.3 and 0.8°C lower and when taken under the armpit, it can be up to 1.5°C lower.

The same goes for your aircraft; you really don't have to know that the hydraulic system LOW OIL PRESSURE light is calibrated at 1,250 psi with a 5% margin and a 3 seconds delayed timer. There are *pilot nerds* writing books which are full of this kind of stuff. Being an author of such book myself, I can confirm that you really don't need to know this level of detail to become a safe pilot. You only need a handful of reference numbers.

When your aircraft climbs through 10,000 ft, what cabin altitude and differential pressure do you expect to see? It makes life much easier if you can recognize and anticipate unusual pressurization indications instead of being surprised by the cabin altitude warning. It takes discipline, or should I say *love and interest*, to get familiar with your aircraft reference values.

If you know how your aircraft V2 speed varies with aircraft takeoff weight, you will immediately detect an error in the loadsheet, an error in takeoff performance calculation or an invalid entry of zero fuel weight (ZFW) in the FMC takeoff weight input prompt…
Many takeoff crashes and tail strikes are caused by obvious – yet unnoticed – errors in the loadsheet or performance calculations.

By the way, if there are three minutes in daily operation where you really need to seal the flight deck and resolutely block any communication with cabin crew, handling agent and ATC, it is when you verify the loadsheet and compute takeoff performance. Also, never let the late receipt of the loadsheet make you rush in an attempt to depart on time. If you end up in the village just beyond the end of the runway, you will be late anyway.

Tailstrike on a 747 beyond economical repair due to a mix up of ZFW and takeoff weight

CRM

Cockpit Resource Management

You are not alone on the flight deck and the way you *interact* with that other human being seated next to you is of crucial importance to overall flight safety. Your airline organizes a CRM course every now and then to meet legal requirements. Are these courses effective?

Combined forces

The time that the captain is *God* and the co-pilot's role is to carry the flight bag and do some radio talk, has gone. Unfortunately this is not true for all cultures worldwide.

That's too bad, because your first officer is a valuable source for feedback on your own performance and errors! Whatever decisions are to be taken in the daily operation of the aircraft, such as basic decisions on fuel, weather and navigation, or whenever you are dealing with an emergency in flight, always be open to your co-pilot's inputs. His or her suggestion may save your day.

Flight deck audio recordings in many aircraft accidents reveal that the first officer gave the correct input, but it was ignored or overruled by god-the-captain. Even worse are those accidents where the other crew member noticed the error but did not say anything because of hierarchical respect or due to lack of assertiveness.

CRM training must focus on the vital importance of combined forces and clear communication on the flight deck, overruling any hierarchy set by religion, sex or culture.

Many aircraft incident investigations reveal that one pilot *believed* the other one was aware of the problem and therefore never mentioned any concern. The monitoring pilot should never assume the flying pilot is aware of any deviations, no matter how obvious they are. Any flight path or aircraft attitude deviation must always be communicated, either by standardized call-outs or any other clear phraseology.

This is also valid on the ground. In many runway excursions, there was no or a late call-out from the pilot monitoring spoiler or reverser deployment.

On the topic of mistakes, who makes the most? The highly experienced captain or the younger co-pilot?

Both make the same number of mistakes, but the types of mistake are different. The co-pilot fails on stick-and-rudder and general knowledge, while the old man fails on management, such as not recognizing loadsheet errors, terrain obstacles, etc.

Most co-pilots have nothing on their mind, only a smartphone, a girlfriend and next week's barbeque.
Now look at the old man; he lost his father last week, his wife wants to divorce him, his mistress complaints about lack of attention, his 15 year old daughter got pregnant, the other one is experimenting with drugs, his 12 year old son is hospitalized for heart surgery, his body is showing age by losing hair and teeth, and he can't pay all the bills anymore…

Either or both pilots could have a long list of issues taking up their mental capacity even before the pilot walks into the airport terminal… It's impossible to leave these things behind when he or she goes to work. This pilot is physically sitting behind the instruments, but his thoughts are elsewhere and crucial errors, warnings and information are not noticed.

"Inform your fellow pilot about your potential lack of vigilance."

Other reasons for mental absence can be fatigue, alcohol and medical drugs. We all have a private life and it happens that we show-up for work with only a few hours sleep. Either you returned too late from a party or your night's rest was interrupted by family matters or by noisy hotel guests. It's important to let your fellow pilot know about your mental state and potential lack of vigilance.

Admit your lack of knowledge

The overall image of pilots is that they don't or shouldn't make mistakes. Pilots also tend to have difficulty in admitting errors. That in itself is a real danger and may have impact on the safety of your flight. Whenever there is something you don't know, just admit it! Do not try to hide your ignorance with some complex sounding bull answer.

If a fellow pilot cannot tell me the values for green-amber-red, I prefer an answer where he admits he doesn't know the values, instead of trying to cover a lack of knowledge by conjuring erratic numbers from a hat. This type of pilot endangers the flight in the sole interest of protecting his or her image.

Should I be embarrassed when I cannot answer some technical or operational question from my trainee co-pilot? Will my status fall because an instructor with 25 years of experience is supposed to know everything? Don't get trapped by this, never try to create some illusion of infallibility. Never try to convince the other pilot with an answer you are not 100% sure of, because this may become a potential hazard for your flight and his or her next flight! Just admit that you do not know the answer – this is what CRM is all about. Admit that you are a human being and so your brain simply forgets things. And as an instructor, I will look-up the topic at home and I will send you feedback by e-mail tomorrow.

The same goes for air traffic communication. Whenever there is any doubt, never try to convince your fellow pilot. Just admit that you did not understand the clearance and ask again, even if this is the third time today. Recently an aircraft in the company had an air miss, because the crew *believed* they had been cleared down to 15,000 feet while the ATC clearance was only to 25,000 feet.

Back in the 70's the first and second officers concerns about an ATC takeoff clearance in low visibility were overruled by the Dutch experienced 747 captain, killing nearly 600 passengers and crew at Tenerife airport.

On several occasions miscommunication has also led to controlled flight into terrain (CFIT), though the latter can have different causes, such as both pilots getting fixated on a flight deck indication or FMC issue and meanwhile forgetting to fly the aircraft. Whatever light illuminates on the flight deck, always make sure someone stays focused on the basic flying and navigation.

Tenerife disaster in 1977: two Boeing 747 aircraft collide on the runway in heavy fog

Admit you cannot make the landing

Every month somewhere in the world a commercial aircraft overruns the runway. In most cases, the aircraft was perfectly serviceable. How can this happen?

Many runway excursions start at top-of-descent, when kept high for traffic reasons. During the ensuing 20 minutes, neither of the crewmembers admits (pilot flying) nor expresses any concern (pilot monitoring) that they cannot make it today… This is a real CRM issue! In this scenario, and many other scenarios, showing off pilot skills appears to be more important than demonstrating people skills. These pilots are not flying the aircraft as a safe pilot; they are only concerned about stroking their ego.

The same goes for long floating and late touchdown. The only thing to do here is to *admit* that you cannot make the landing instead of trying to get things sorted within the remaining runway distance.

Always be go-around minded! Going around, even after main gear touchdown, demonstrates good judgment and professional maturity.

I humiliated my co-pilot for his poor landing on the way out and now I find myself messing-up my own landing at home base. Shall I try to cover-up my even worse performance by continuing the landing or shall I initiate a go-around and lose face as an experienced captain?

Some pilots regard a go-around as a loss of face, an embarrassing admission that you messed up the landing. Don't be concerned about what your fellow pilot thinks about your landing, because the same will happen to him or her tomorrow. Don't worry about your late schedule. The airline management should never query you about a go-around and a subsequent 10 minute late landing. But they will definitely ask questions if your aircraft skids off the runway – if you are still around to tell the story.

Yet, many pilots pass through company defined stable approach gates in the flawed belief they can fix it later and that the flight parameters will soon return within tolerance.

Each time you get away with it, the belief that passing through stable approach gates is no big deal for your level of experience is reinforced, and the invisible line is pushed further ahead. Without any doubt, one day you will fail and you end-up beyond the end of the runway!

You find stunning spotter movies on the internet showing passenger carriers touching down mid runway and making it to a safe stop. Sorry to say, but these pilots have a CRM attitude problem.
Overconfidence, or rather underestimating the danger associated with continuing a late touchdown, is a common factor in runways excursions.

It's very easy to determine whether or not a pilot is go-around minded. Just look at his hand on the thrust levers. If you see that hand move forward during a long floating flare prior main gear touchdown, the pilot's mind is setup for expeditious deployment of the thrust reversers. This mindset eliminates any option for a safe(r) go-around.

The Indian 737 captain initiated a go-around after reverser deployment on late touchdown

Today is a beautiful day, the weather is clear sky. The landing runway is straight ahead, but you are way too high… The experienced captain is flying and he decides to continue. You don't have much experience, but it's abundantly clear that the aircraft can't make it. What will you do?

You tell him that you are too high, but the anxiety in your eyes creates a smile on his face, and he responds to your manifest unease with a know-all attitude; *"Don't worry, my friend, I have 10,000 hours on this aircraft, we can make it. Today, you are going to learn something, watch me."*

Take this in 3 steps:

- Step 1: express your concern – *"Hey captain, I think we are too high."* This is where you get that condescending smile.

- Step 2: make a suggestion – *"Hey captain, let's go-around"* This is a good one, allowing him to bail-out. Because in the meantime he found out himself that he can't make it. This suggestion allows him to save his ego and just perform the go-around *"because you insisted…"*

- Step 3: instruct a go-around – *"GO-AROUND, I say again, GO-AROUND !"* the second call just to make sure the command was clear and registered as such on the cockpit voice recorder.

These three steps will save the day in most cases. Some years ago, an Indonesian 737 passed the threshold at 250 knots and continued the landing. Are you going to takeover control at 200 feet above ground and then both push-pull-turn in opposite directions? Don't!

Why would pilots still continue while it's obvious you cannot make it? Home driven or plan continuation bias is the natural tendency for a human being to not accept deviation from a planned course of action.
The ultimate action you as a first-officer can do at this stage is to get the other pilot out of this tunnel vision by raising the landing gear. He will not appreciate your action, but by natural reflex no pilot will continue the landing. Just for the record, don't take this as a SOP.

Back to the subject of making the landing, weather conditions and air traffic clearances also play a major role in many runway excursions.

Pilots may accept difficult ATC instructions due to professional pride in being able to make it in any situation without consciously evaluating the increased threats associated with the new clearance. ATC instructions should be declined when they force you into a position of making a rushed approach.

"Going around demonstrates good judgment and professional maturity."

Television news often reports that the aircraft crashed due to bad weather. There is no such thing as bad weather anymore. You have an excellent weather radar and a predictive windshear system, warning you way ahead of bad weather. We are dealing with pilots who feel overconfident and believe their experience can handle any weather. On-time performance, expensive diversions and the initial plan to land at the destination, make pilots elect for a second landing attempt in bad weather instead of diverting to a clear weather alternate airfield. All preceding aircraft made it safe into Denver, so I don't want to be the *loser* that has to divert…

In several accidents the aircraft crashed upon the second or third approach. Never execute a third approach on the same airfield with same weather conditions. And omit even a second approach if that eliminates diversion to a clear weather alternate airfield.

When flying into bad weather airfields, do not calculate landing distance using the actual weather conditions. You are better-off reverse-calculating maximum acceptable cross- or tailwind and worst expected runway contamination for planned landing weight and runway length. Compare actual wind and runway state with these limits during the entire approach and abandon the approach as soon as calculated limits are exceeded.

Admit you are running behind

One of the top-ten phrases on the flight deck, ranked number 2 after *"I need coffee"* is *"What's it doing now?"* Today's complex flight deck automation with numerous modes and various software updates, often cause pilots to run behind their aircraft.

I don't have any at home, but I compare the aircraft with a dog. A well-trained dog never walks in front of you. It will walk next to you, or slightly behind you, making it clear who's the boss. The minute your dog steps in front of you, you will pull the leash and make clear you are in charge. The same goes for the aircraft and autopilot. The minute (or rather second) you get behind, you must show who's in control. But how do you recognize that you are running behind?

Whenever you deviate in any of the four aircraft dimensions (position, altitude, speed and configuration) you are running behind. A typical example is the autopilot maintaining level flight while it was supposed to pick-up the glide slope. I see many pilots trying to correct this situation by pushing several buttons on the autopilot control panel, but the solution might be to simply switch-off automation and fly the dog!

The real danger is recognizing and *admitting* that you are 2 steps behind. When the autopilot does not pick-up the glide slope, pilots may get focused on the descent profile and forget to lower the landing gear, which was planned at this point in the approach. Now, you're running behind in 2 dimensions, altitude and configuration. Immediately abandon the approach and go-around!

Use appropriate automation level

Automation was brought into the aircraft to reduce workload. However, using the wrong level of automation for a given phase of flight may increase workload.
For many pilots, the opposite is true. As soon as they feel themselves getting behind the aircraft, they switch-on the autopilot hoping that automation will resolve the situation…

Many younger pilots cannot resist playing with the FMC when receiving a last-minute ATC change. In the worst case, both pilots find themselves head-down clearing a FMC conflict, which may result in loss of situational awareness in dense traffic or in high terrain environment, and increase the risk of CFIT.

With the autopilot engaged, make sure you keep hands on the control wheel and thrust levers when below 5,000 feet height. Physical contact with the aircraft controls allows you to immediately detect system unplanned mode changes or system malfunction and avoid deviations from the planned flight path or aircraft performance. Airbus drivers don't get return through thrust lever or sidestick displacement, but should still keep their hands on the controls for manual takeover whenever any deviation is observed.

"Whenever you run behind, switch to a lower level of automation or switch it off and fly the dog."

Besides the ability to use automation to its maximum extent, pilots should also practice and maintain manual flying skills. When was the last time you manually flew an ILS down to the minima in 3 miles / 5000 meters visibility on a real aircraft? Are you still able to do this? While most aircraft manufacturers and companies recommend maximum use of automation, pilots should be encouraged to switch-off the autopilot and manually fly the aircraft below 15.000 feet, traffic and weather permitting. Many long haul wide body pilots with 3,000 hours logged on type actually have only 20 hours of hand-flying, that is 2 minutes on takeoff and 2 minutes on landing.

Whenever you end-up running behind the automation, switch to a lower level autopilot mode, like heading and vertical speed, or switch-off all automation and just *fly the dog*.

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He is the author of the **B737MRG** and **A320MRG** pilot handbooks, which are relied upon by tens of thousands of pilots worldwide, including China.

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