

# Aerobatic Training may Save Your Life

**WHEN** I heard this issue of KiwiFlyer was focusing on Flight Training, I started thinking about the advantages for a pilot – any pilot – in carrying out aerobatic training as part of their overall flight training journey.

You might think that some pilots will never need aerobatic training – what would a pilot of a basic microlight, or an Airbus A380, or a glider pilot need with aerobatic training? “I just want to get my PPL to take my friends/family/workmates (delete as required) to Wanaka/Pauanui/Martinborough (delete as required), for a nice day out”. That’s as good a reason as any to learn to fly, but how safely do you want to do this? A plane is not a car – you can’t just pull over to the side of the road when things go bad. You need to learn, practice and remain current in skills that are both ‘motor’ (hand and feet) and ‘cognitive’ (head-stuff), to manage situations that can rapidly evolve.

During the 1990s I was flying Boeing 737s, and during this time there were a couple of notable accidents in the USA involving this common airliner. These accidents came about from a phenomenon which came to be known as ‘Rudder Hard-over’. As the term indicates, this is the movement of the rudder to either of its full-travel stops.

Most aerobatic pilots know this control input well, and employ it for several manoeuvres to great effect – stall turns, spins and snap rolls in particular. Of course we do this intentionally, in aircraft designed for these manoeuvres, and through training and practice become familiar and very comfortable with the associated sensations.

Alas, in the case of United Airlines UA585 and USAir UA427 the pilots were not anticipating nor expecting the un-commanded full deflection of the large and powerful 737 rudder, which came about as a result of a unique control system fault in the hydraulic

actuators. With limited height and relatively low airspeed to manoeuvre and recover, both accidents resulted in the tragic loss of all on board.

It took investigators from the FAA and Boeing many years to determine the actual cause of this type-specific problem and then put remedies in place. One was an increase in approach speeds to produce more control effectiveness should an un-commanded hard-over occur again, whilst another was a new memory checklist for 737 pilots called JAMMED FLIGHT CONTROLS and latter UNCOMMANDED YAW OR ROLL. Within the airline, we were required to become proficient with these new procedures in the simulator, whilst engineering went about

fitting improved components to the rudder system. There have been no subsequent accidents as a result of ‘Rudder Hard-overs’ with the 737 series as a consequence of the lessons learnt from these earlier tragedies.

I don’t know anything about the background and experience of the pilots involved, and most certainly do not wish to judge their performances on the day – they would have been trying their best, with the skills and knowledge they had acquired, to keep the planes safely flying. However, my own background in aerobatics and then practice in the simulator enabled me to consider what instinctive actions we take when presented with the high-jeopardy and life-threatening situation of an un-commanded rudder hard-over.

Think through the scenario with me: the sudden and violent yaw will produce a sideslip, resulting in one wing generating more lift and quite possibly less drag than the opposite wing (even more so in a swept-wing jet). The secondary effect of yaw results in a roll in the direction of the yaw, invariably accompanied by the nose dropping as well. Pulling back on the stick may seem logical, but at a certain bank angle you are now ‘pulling’ the nose even lower (do



John Eaton's 360hp radial powered Model 12 Pitts - Gavin Conroy photograph.

Gavin Conroy



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some 'hand' flying to visualise this). With the windscreen full of paddocks, the instinctive reaction to pull back on the stick even more may result in a tighter spiral dive, evident by increasing 'G' and airspeed.

Early on, we might be tempted to try opposite aileron to roll out of the turn, however if the aircraft has come close to- or actually stalled and entered a spin, both out-spin aileron and increased up-elevator will further aggravate the problem.

The recovery from this situation may seem counter-intuitive, but this is where the benefit of aerobatic training comes in. After applying full rudder opposite to the direction of yaw, you must push forward – all the way, depending on the aircraft type - to reduce the angle of attack. That is the hard bit – the nose is already pointing down yet you must now push the stick even further nose-down. You must also centralise the ailerons, despite the roll you are witnessing, to remove any drag-couple that may be keeping the auto-rotation of the spin going. With airspeed increasing and the yaw/roll slowing down, both wings should start flying again, and the effectiveness of all the flight controls increases every second the plane is accelerating. Now you can use the ailerons to roll the wings level, and with the lift vector pointing back upright



A USAir 737-300 (above) and the 737 Hardover (right).



you have the ability to manoeuvre away from the immediate threat - the ground – with the careful use of elevator.

You have survived.

Re-read the scenario several times, to visualise the entry, flight path, and the recovery. However, please bear in mind reading this article (or any article) is no substitute to actual flight instruction.

When written on the page of a magazine this all sounds pretty logical and straight-forward stuff, perhaps, but until a pilot has experienced first-hand the rush and sensations that go with unusual-attitude flying there is no telling how he or she will react. Human Factors people sometimes describe the reactions of people in times of great jeopardy as either 'Fight, Flight or Freeze'. Will you Freeze at the controls and be a passenger on the final spiral into the ground? Will you take Flight and make rapid, large but ultimately incorrect and ineffective

control inputs that have the same ultimate ending? Or will you Fight the problem with skills learned, practiced and kept current, to resolve the situation and fly away to tell the tale?

Preferably, we should be putting ourselves in the 'Fight' corner. However, this doesn't come naturally - unlike a bird, we aren't born with wings and the inborn skills of flight. We need to learn

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these skills and as we progress through our piloting journey we must, at times, recognise our lack of knowledge in certain areas and push ourselves to seek out and learn more. The core skill-set all pilots should possess should enable us to not just survive flying but to fully enjoy and revel in it, secure in the knowledge that we can cope with almost anything the aircraft, Mother Nature and fate can throw at us. Can you?

Seeking out more advanced training can seem daunting to some – we are all wired differently with regard to self-confidence, comfort-levels and fear of the unknown. Unfortunately, the laws of physics, which ultimately govern the rules of flight, are very rigid – WE are the flexible value in the flying equation and WE must determine for ourselves where we want that value set.

Different training systems and organisations advocate different approaches to advanced manoeuvre training. In some organisations – most notably the various air forces of the world – aerobatics is introduced very early in a student's training. Of-course, the air force system is often designed to produce fighter pilots (in countries that can afford or justify fighters...) so it is natural that their training from the get-go has aerobatics as a core component. In the GA world, funded by private and/or discretionary money, the training organisations may have a bias towards 'keeping people flying and not scaring them away', or even take the approach 'they will just go on to fly C172s/jets/microlights'. Many training organisations may not have the planes or the instructors available to carry out advanced manoeuvre or aerobatic training – you may have to travel to seek out either or both.

For many people, becoming a pilot is outside of their comfort zone – and if this is you, good on you for giving it a go. The rewards are obviously worth it or you wouldn't be reading this fine magazine. But perhaps pushing deeper into the physical and mental flight envelope - in the right aircraft and with an appropriate instructor – will expand your skills exponentially, giving you greater self-confidence that will enable you to enjoy your flying more, whilst also enhancing safety for both yourself and your passengers... whatever you might fly.

**Footnote:** These articles are intended to whet appetites for advanced flying and to offer tips to aerobatics beginners. Dual instruction and observance of CAA rules is a must-have - especially for safety and also for learning correct techniques and finesse of manoeuvres for the particular aircraft you are flying. For more information, enquire about aerobatics instruction at your local aero club or go to [www.aerobatics.co.nz](http://www.aerobatics.co.nz)

## Planes of the NZ Aerobatic Club: The Pitts Special

**HOW** could we talk about aerobatic aircraft without mentioning the Pitts Special? Particularly as this year is the 70th anniversary of the first flight of Curtis Pitts' creation. To help celebrate this milestone, a Pitts-focused fly-in will be taking place at Omaka on November 13th-15th. Anybody with a Pitts, or a past connection with Pitts Special aircraft, is encouraged to attend. It goes without saying there will be Pitts aircraft flying aerobatics in friendly competition, as well as a social event for Pitts people to talk... Pitts! Check out the events page of the NZ Aerobatic Club website for more info.

Over the years there have been many Pitts aircraft built or imported into New Zealand. Renowned for their aerobatic prowess but also tricky ground handling, more than a few have come and then gone from the local scene, sometimes to reappear again even better than before!

Because many Pitts are amateur-built, modifications abound, and the design has come a long way from the 500lb, 55hp original. Right now in NZ we have eleven variants on the register, with a few languishing or about to be born or re-born. The biggest, most powerful model currently

flying in NZ is John Eaton's exquisitely built Model 12, regularly displayed around the country by Pitts maestro Richard Hood. Powered by a 360hp Russian radial, it is a

far cry from the original, which is perhaps better represented by the more prolific S1 model we see here.

Owned and flown by Darrel Brown since 2006, ZK-EES was originally built and flown by Max Clear (of Bantam microlight fame) in 1975 as an S1C with ailerons on just the lower wings. With just 200 hours on the clock Richard Hood, Owen Harnish, Steve Taylor and Mike Waring

bought it in the mid-eighties, the syndicate reforming sometime later with John Kelly and Marinka deVries (later Hood). Richard gave it the hot-rod treatment in the mid-90s with a 180hp engine, pressure cowls, symmetrical aerofoil wings, and top and bottom ailerons. Extensively displayed throughout NZ, EES would also take Richard on to countless competition wins including in the Unlimited Category against much more powerful aircraft.

With an empty weight of just 807lbs, performance is very spirited, but equally the light and dainty handling of the S1 Pitts aircraft is truly endearing, making their popularity understandable.



Pitts S-1 Special ZK-EES



Curtis Pitts in 1945

## Competition Aerobatics Events Calendar 2015

For more details check out the events page at [www.aerobatics.co.nz](http://www.aerobatics.co.nz)

October 31	Flying NZ Central Region Competitions, Taumarunui Aero Club
November 7	Flying NZ Alpine Region Competitions, Mid Canterbury Aero Club, Ashburton
November 14	Flying NZ Lakes Region Competition, Venue to be confirmed
November 21	Flying NZ Cook Strait Region Competitions, Wanganui Aero Club
November 13-15	Pitts 70th Anniversary Fly-in and Competition, Omaka Airfield
November 21	Brian Langley Memorial Trophy, North Shore Airfield
November 28	Flying NZ Northern Region Competitions, North Shore Aero Club
February 23-28	Flying NZ Nationals, Mid Canterbury Aero Club, Ashburton
March 16-19	NZ Aerobatic Club National Championships, Hood Aerodrome Masterton