

UPRT for the Private pilot

Pilot's Assistant Editor gets 'upset' in one of Ultimate High's Firefly trainers and learns how to recover the situation

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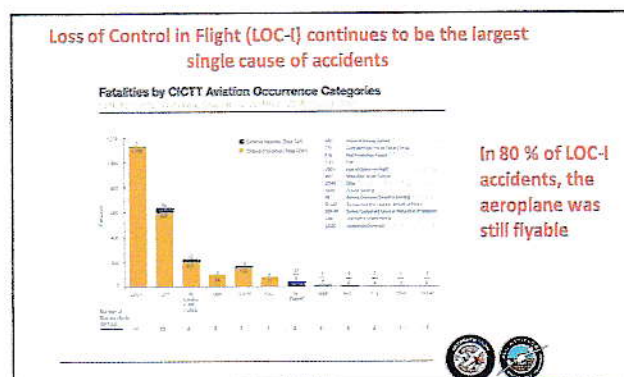
Not everyone wants to become a commercial pilot. Having achieved a pilot's licence, some go on to get a night rating, fly aircraft with wobbly props and/or retractable undercarriage, others go for an IMC or even the CB(IR). Many simply enjoy flying about in their local area, taking up friends and family, visiting airfields nearby and farther away in daylight VFR—fair weather fliers. I count myself in the last batch.

What unites us all is that the unexpected—an upset—can happen at any time and to any one of us, so being better prepared to recognise the situation and deal with it appropriately is vital. From December 2019 (delayed from Dec 2018) new commercial pilots will have to undergo mandatory Upset Prevention and Recovery Training (UPRT see *Pilot*, May 2019) and several organisations now offer UPRT geared to GA

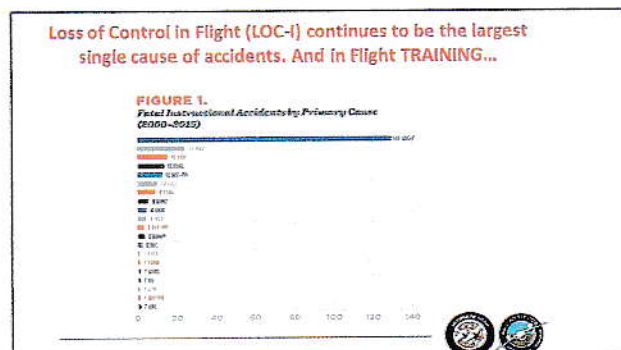
pilots. As a “normally right-way-up pilot” (the Editor's description), I accepted Ultimate High's invitation to experience their GA course.

Each GA UPRT session that Ultimate High delivers is geared to the individual pilot. People have differing levels of skill and ability, so one size doesn't fit all, although elements of the training will be common to most. Ultimate High doesn't want to scare people off: on the contrary, the aim of the course is to build confidence in the pilot's ability to 'Avoid, Recognise, Recover'. Loss of Control In flight (LOC-I) is the biggest single cause of aircraft accidents in both GA—including flight training—and the commercial world, so learning how to avoid, recognise and recover has got to be a good thing!

Founder and CEO, Mark Greenfield—'Greeners'—took me through a quick presentation on what upset recovery is, what my time there would cover, both →



UH slide shows how loss of control figures in accidents...



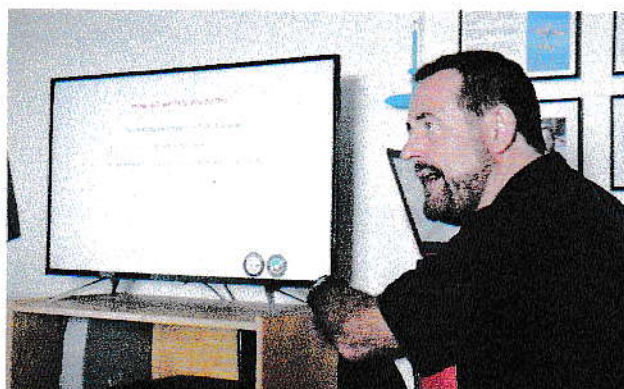
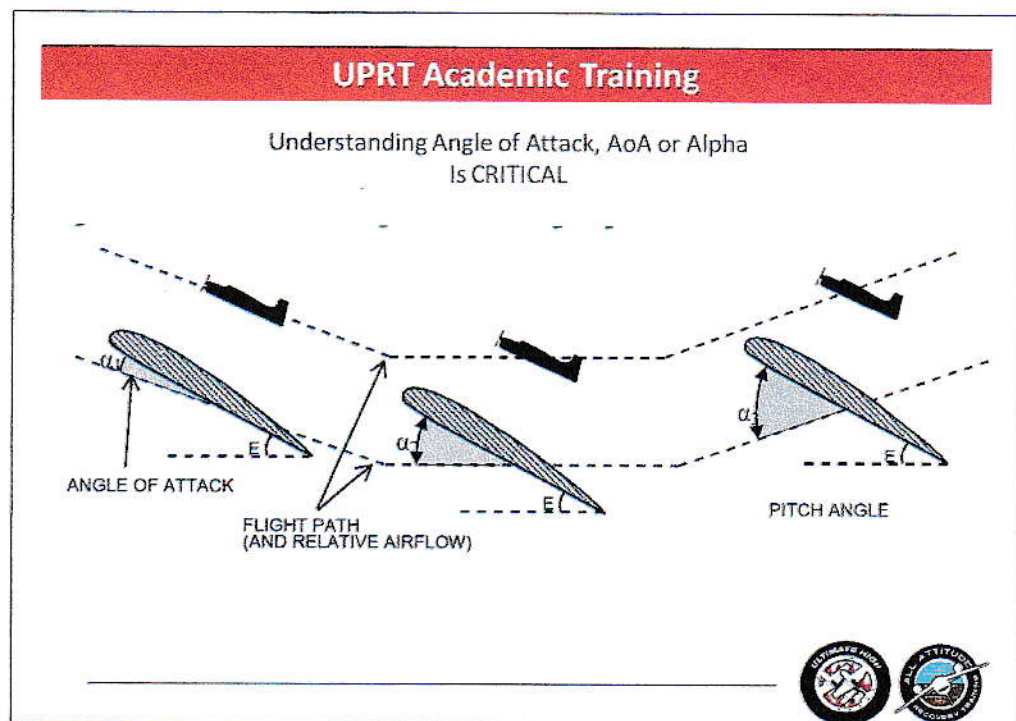
... especially accidents in flight training, instructors might note

on the ground and in the air, and what we hoped to achieve. I learned that understanding angle of attack (AoA—the difference between pitch angle and flight path angle) is critical to the training. While light aircraft don't normally have an angle of attack indicator, actually the stall warner can perform this function—identifying increasing alpha *before* the stall and blaring out. The critical angle is around fifteen degrees (although it varies substantially between different aircraft) and the wing can stall in both nose-high and nose-low attitudes.

An 'upset' (UP) is generally recognised as an in-flight condition where an aircraft unintentionally exceeds the parameters normally experienced in normal line operations or training, i.e. the pitch of the aeroplane unintentionally exceeds either 25 degrees nose up or ten degrees nose down, or a bank angle exceeding 45 degrees, or flight within these parameters but at inappropriate airspeeds.

There can be many causes of

ABOVE: UH graphic makes the difference between apparent pitch angle (constant here) and AoA very clear



Ultimate High founder 'Greeners' delivers his UPRT briefing in typically witty, but serious style...



... and his students, including Judith, concentrate hard on the message – this is interesting and thought-provoking stuff

upset: external (environmental) ones could be turbulence or icing; systems can give incorrect readings; and pilots can be distracted or not cross-check instruments, among many other things. The immediate reaction, however, of finding oneself in an upset situation is the 'fight, flight, freeze' one, which can not only lead to inaction but also result in an instinct to pull up, regardless of the attitude.

Mark explained that we all have a mental 'capacity bucket' which can fill rapidly in upset situations, such that there's no space for remedial action: if the bucket is full, nothing else can be put in it. The training aims to instil confidence, allowing the pilot to maintain some capacity in the bucket to recognise and deal with the situation. And while avoidance and early detection of undesired aircraft states are the aim, the training is intended to offer skillsets and experience to detect and recover from upsets when they do occur.

While CRM and human factors apply more to airline training than GA, Mark uses the infamous Air France and Air Asia accidents to illustrate that the simple 'Push, Roll, Thrust' technique can work in any scenario—and could make some room in the capacity bucket. In the former, the aeroplane

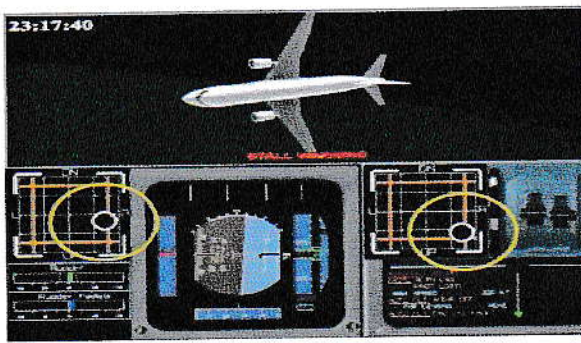
took more than four minutes to wallow down into the ocean in a stalled condition while the pilots reacted to, but didn't recognise the situation or take the correct recovery action. And in the Air Asia situation, the black box revealed that the two pilots were not working together but that each was taking different actions (rudder, pitch etc) and neither recognised that the fundamental problem was that AoA had exceeded normal safe limits.

Theory into practice

All the theory makes a lot of sense and is easy to assimilate sitting in a classroom with a cup of tea. What's it like putting it into practice?

Ultimate High uses the former military T67 Slingsby Firefly for UPRT training. Aerobatic and stressed to +6/-3g, its 260hp engine is powerful enough to demonstrate all the required upset manoeuvres but it is also a stable platform for the trainee, and nice to fly. Ultimate High's suite of instructors are all highly qualified and experienced former RAF pilots. My instructor was their extremely capable CFI Steve 'Jos' Johnson. Jos joined the RAF in 1978, flying and displaying Harriers, before a stint in the Red Arrows, including as synchro pair lead. In civilian life he was part of Nigel Lamb's Pitts aerobatic

• Note: Rudder input, Roll, Pitch & AOA Input from both side sticks



Aircraft in upset¹³situation

Conditions:

Speed (knots)	118 (ISIS)	0 (CAS)
Alt (Feet)	37796 (ISIS)	
Rudder	-5°	
Roll	-104°	
Pitch	-20.7°	
AOA	46°	
VS (fpm)	-4784	
N1	52%	
EGT	563 °C	
Sidesticks	PIC P: -4° R: -20°	SIC P: -16° R: -17°

display team, and has flown a number of warbirds. He recently retired from thirteen years at Virgin Atlantic flying Airbuses. I was in very safe hands!

Although I was to have a brief presentation and one flight, the course usually spans a full day, including around three hours of ground presentation and two 45-minute flights, during which upset manoeuvres and their recovery are demonstrated. Then the trainee does the recovery. Courses are tailored to the trainee. After some general handling to get used to the aircraft—steep turns etc—manoeuvres start

with simple stalls. Further upsets include nose-low and nose-high, spiral dive, accelerated stall (higher g not speed), incipient spin, slipping and skidding turns and stalls, progressing eventually to a simulated wake turbulence encounter.

Mark had explained the Ultimate High mantra of 'Push, Roll, Thrust' as the simplest upset recovery technique. In times of upset, and with a potentially full capacity bucket, the intention is that the pilot will remember that simple process. And, if all else fails, he or she may at least remember to push to start the

ABOVE: Air Asia accident – even when captain (PIC) and FO (SIC) were applying similar control input (circled in yellow) they failed to correct the A o A by pushing the sidesticks forward

process of recovering the aircraft and lowering the level of their mental capacity bucket.

All the information felt very logical; what felt strange was articulating the "Push, Roll, Thrust" process. Saying the sequence out loud is contrary to normal training practice—but, having carefully read both Pat Malone's column on the subject (*Pilot May*) and the July 'Airmail' letter response from a train driver, it seems the practice is becoming more widespread and a known technique to help embed training. Having occasionally in the past been guilty of repeating back QFE to a controller, even writing it down on my kneepad, but not actually setting it on the altimeter, I could see the benefit of the 'say and do' approach.

Another important part of the ground training covers TEM—threat and error management. This includes: identification of threats at briefing stage; implementation of effective avoidance or mitigation; comparing reality to the plan; highlighting deviations and resolving them. On the day I visited 'Glorious Goodwood' races were underway, so there were plenty of large helicopters on the airfield, well-dressed racegoers being escorted from airside to chauffeur-driven cars, →



Before getting student Judith settled in the cockpit, instructor Jos goes through the threat and error management, pointing out among other things the race day helicopter traffic. With its easy handling, tricycle undercarriage and inbuilt strength, the Slingsby Firefly is the ideal aircraft for UPRT

and a captive balloon flying over the racecourse: a good opportunity to apply TEM while walking out to the aircraft and as we taxied out in G-BWXS.

I'd taken my flying overalls with me, anticipating they may be the preferred attire, but Jos explained that, as GA pilots wear a variety of clothing when flying, they stick to 'normal' clothing for the GA UPRT course. So, wearing jeans and t-shirt, I was strapped tightly into the Slingsby's right-hand seat. I didn't need anything else as Jos would handle radio, navigation etc. I only needed to concentrate, watch, listen, learn and do! The whole sortie would be filmed which would make a good record for me—and some of the screen grabs are used here. We would use the usual 'You have control', 'I have control' communication between us, together with 'Recover now' when Jos had put the aircraft into an upset situation and wanted me to put it right. 'Recover now' is shorthand for 'You have control. Using the standard Push-Roll-Thrust recovery techniques on a Say and Do basis, recover the aircraft to level flight'.

Having taken off from Goodwood's not-completely-smooth Runway 28, Jos handed me control to "take us up to 4,000 feet, 90kt in the climb, heading off in that direction". That gave me chance to get the feel of the Slingsby's handling—and a stellar climb rate compared to my usual C150—and also the stick, with electric trim. There's the usual central throttle—a lever rather than the plunger-type I am used to—and also a side throttle repeater by the instructor. The constant speed propeller was managed by Jos throughout (one further advantage of the Slingsby is that it's almost impossible to overspeed the prop whatever the manoeuvre).

The horizon at 4,000ft turned out to be somewhat hazy, so we went back down to 3,000ft. Established there, and with the usual FREDa and HASell checks completed, I tried some 45° turns each way. Inevitably, I was a bit cautious with the manoeuvres and also tense, prompting Jos's first tip, "If you feel yourself tensing up, relax your ankles". What? No,

ABOVE: Judith looks pensive before flying and as Jos closes the canopy

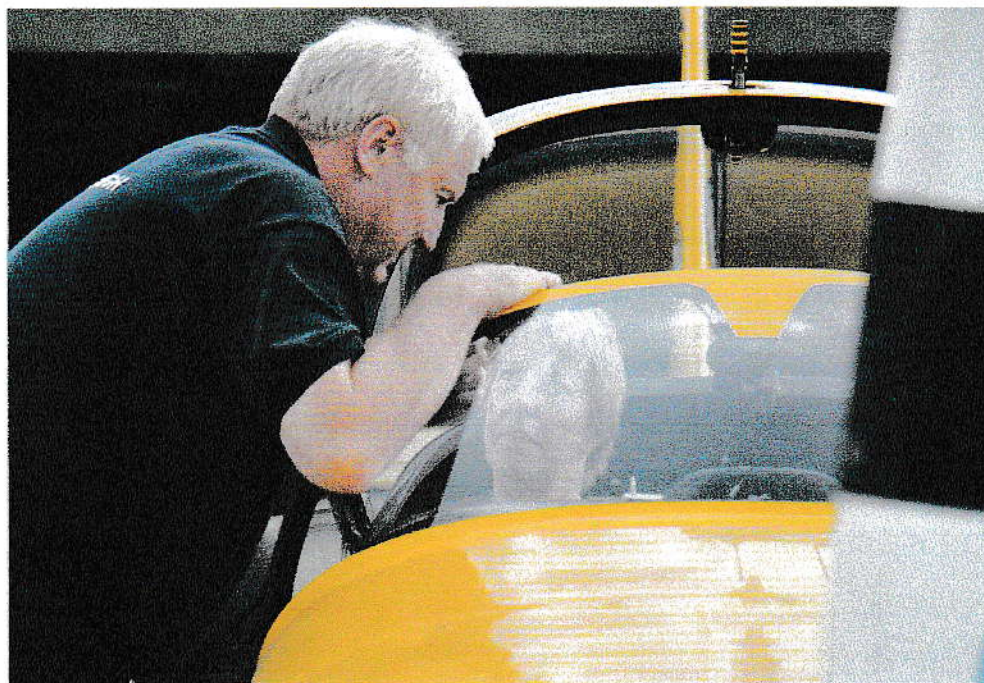
I only needed to watch, listen, learn and do!

he didn't know why it worked, but it does, although you may have to do it several times for it to take effect. Something he'd learned and applied in the Red Arrows and the Pitts team formations.

On to clean stalls—when the wing exceeds the critical angle of attack. There's a decent buffet from the Slingsby when approaching the stall and the stall warner first blips and then blares out at 62kt, prompting the first demonstration and articulation of "Push, Roll, Thrust" from Jos. Then it was my turn, at first doing rather than saying until

prompted. Most private pilots, I would venture, don't practise stalls that often, and then anticipate the buffet or warner, so simply push the stick forward and apply power, assuming there will be no 'roll' (wing drop) to correct. My introduction to recovering from the stalls was fine but my 'saying' was poor! Let's try again. Better next time.

On to nose-low UPs. Any banked turn could take you beyond the ten-degree nose low definition of an UP but the same 'Push, Roll, Thrust' response will address the situation. Jos then talked about





cadence of response. In a spiral dive, for example, you need to take action fast. "If we're going down, we don't want to mess about, 'cos we're charging towards the earth." If you're in a nose-high situation, however, you may need to be more cautious and avoid sudden actions while still following the 'Push, Roll, Thrust' sequence. You need to be more gentle and follow a different cadence. And if the nose is really high, you may not be able to see the horizon to determine which way to roll, so getting the nose down first is crucial.

"Now, let's have a look at a

spiral dive. For GA, I think a spiral dive is possibly the most dangerous situation that anyone can get into," said Jos. "And if you have to think, 'oh, is this a spin or a spiral dive?' it's too late." The spiral dive can arise from an overbanked turn, for example, and indications will be a high rate of descent, rapidly increasing speed and – very likely – increasing g. The difference for a spiral dive upset is that 'Recover' must come after the quickfire 'Push, Roll, Thrust' actions as the aircraft is otherwise still heading down to earth. And you may need

ABOVE, FROM TOP: nose well below the horizon and speed building in the spiral dive; and banking into a level turn to pull three g for the accelerated stall

less rather than more thrust.

My first attempt brought the caution from Jos, "you could be quicker in pulling the stick back and getting the nose up as we're going to end up in a dive, pointing at the ground, and if we've not been quite prompt in doing it, we might be quite close to the ground." The next one was better but I still needed to pull quicker; my third go was better still – all a learning curve.

Jos now moved on to talk about accelerated stalls, which doesn't mean speed but g force acceleration. Keeping the speed at 90kt, he pulled on bank increasing g to around 3g, and the Slingsby obligingly stalled at 90kt. Jos recovered – using 'Push, Roll, Thrust'.

If you are up for it...

The final two upsets in the flight were the incipient spin and wake turbulence. The latter is not always on the card, as it depends on the trainee's ability to cope with the manoeuvre. Jos made clear that it's no reflection on anyone's ability, man- or womanhood if they can't take it. I'm lucky; I've never suffered from any form of motion sickness, so we did progress to that. But first the incipient spin.

As Jos explained, "If the aeroplane does something you're not expecting it to do, if you've got any rudder on, centralise it, and move the stick centrally forwards. With the wing at high A o A, we're in the regime where the wing is close to the critical angle, however, so we have to fly the aeroplane carefully. The cadence changes." He demonstrated. Pulling back above the normal A o A, and adding some yaw, the aircraft skidded towards the ground. This was another upset where it was necessary to take definite 'Recover' action after the 'Push, Roll, Thrust' sequence, as – again – the aircraft still could be pointing at the ground. I tried a couple and the aircraft responded to the sequence of actions, including recovering to level flight afterwards. Jos continued: "This is where I think GA pilots should be trained, so if they ever get themselves into that situation they can do this", he pushed an →

imaginary stick forward. "Once they've done that, they've got half a chance of recovering the situation to this and then, if they've got enough nous, they can get their head in front of the aeroplane and solve the situation. Then they can get back to aviate, navigate, communicate."

And so to a demonstration of wake turbulence. Private pilots are unlikely to encounter this – fortunately! Ultimate High uses a half flick roll to simulate wake turbulence and in just two seconds the aircraft goes from straight and level flight to rolling upside down. Again, 'Push, Roll, Thrust' recovers it to straight and level flight. Definitely interesting to experience (I asked to have another demonstration) but I do hope never to encounter it 'for real'.

Before we headed back, Jos also showed me the overbanked nose-low UP, using the same recovery technique. He reminded me that Mark had mentioned that sometimes the pilot may not be sure which way to roll – but that it didn't matter which way, so long as 'Roll' was part of the recovery sequence.

After around 45 minutes



airborne, I had learned a huge amount and gained in confidence. Not over-confident (I tend to the cautious) but certainly much better equipped to understand that the simple sequence might just get me out of trouble and save the day.

Ultimate High says, if all else escapes the overloaded

mind bucket and a pilot only remembers to push, that will help. It won't do everything but it may free up some capacity to start thinking, start to recover the aircraft, and work out what went wrong and what to do next. I would strongly recommend a UPRT course to any GA pilot!

ABOVE: as Judith was up for the 'wake turbulence' upset, Jos obliged

BELOW: not only is it an enjoyable informative course, but the setting is so nice – Ultimate High's Goodwood premises

