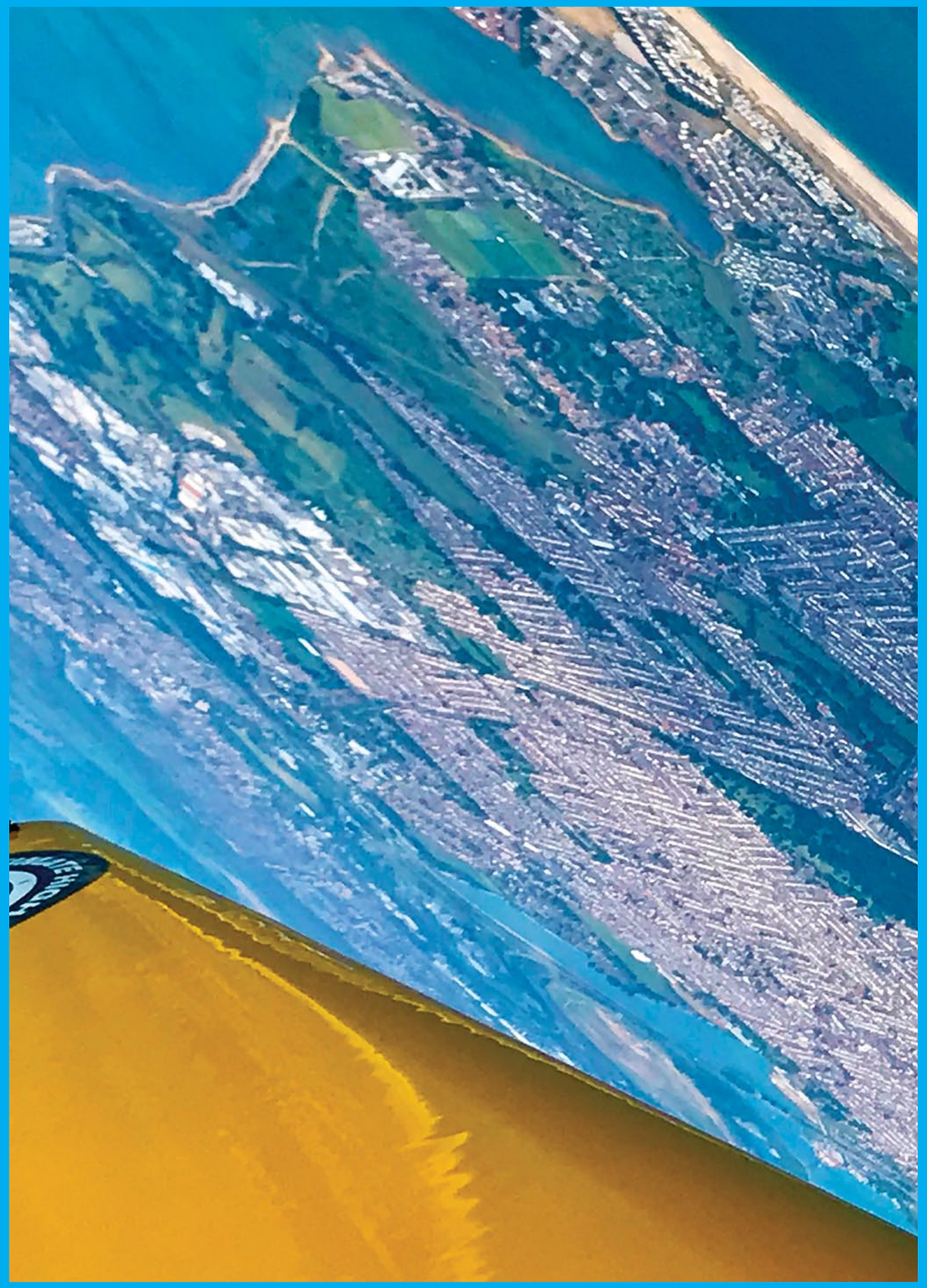


TECHNIQUE

Upset Recovery Made Simple

UPRT – UPset Recovery Training – is about to become mandatory for new commercial pilots but it also has a place for General Aviation pilots. **Dave Calderwood** takes the UPRT GA course with Ultimate High

There's a new emphasis on Upset Recovery Training, known as UPRT, because of various airline incidents where it appears the pilots may have lost or forgotten their handling skills. But it's not just the airlines. General Aviation accident reports are full of incidents where pilots have demonstrated disorientation when encountering instrument meteorological conditions (IMC) or just have rusty flying skills. The aviation industry calls it 'Loss of Control In Flight' or LOC-I, and it's the biggest single cause of accidents.

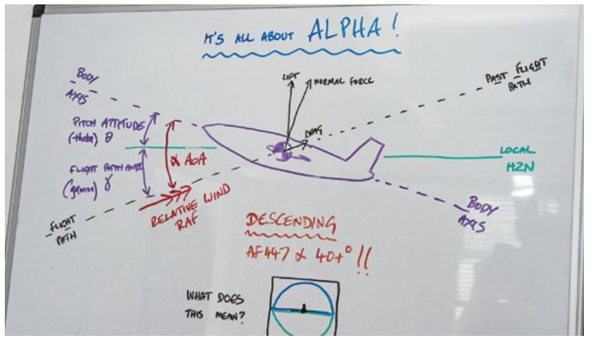
Until recently, Upset Recovery Training for most private pilots was limited to the 'recovering from unusual attitudes' elements of PPL training. You remember: your instructor takes control, steers the aircraft all over the sky in varying attitudes, leaves it pointing up or down, and hands it back to you and says, "You have control." This is also covered in the Skill Test but that's possibly the last time you ever experience an 'unusual attitude'.

Left UPRT will teach you how to recover from this situation – and how to avoid it in the first place

That's unless you've taken it into your own hands to get some additional training. If you've tried aerobatics then one of the first exercises you'll do is recovery from a spin. You learn this because it's entirely possible – some would upgrade that to 'probable' – that during an aerobatic manouevre it might go awry and pitch you into a highly unusual attitude leading to a spin.

It's a bit of a shock, that first spin. It's typically induced by the instructor by pointing the nose of the aircraft high, pulling back the power and as the aircraft runs out of energy, putting in a bootful of rudder. The aircraft flicks into a spin and the world starts to rotate. Some instructors will let the spin 'fully develop' – a euphemism for keeping it going 'til one of you goes green in the face – before demonstrating the correct technique for recovering back to straight and level flight. The actual technique does vary from aircraft to aircraft although there are some common points, and it can also vary according to the weight & balance.

But this isn't for everyone. For instance, much as I



Above "It's all about Alpha – the Angle of Attack
Right Ultimate High's Mark Greenfield during the in-depth preflight briefing, explaining how the aircraft can stall when attempting to pull out of a dive

enjoy the occasional aerobatic sortie, it's only ever with a highly experienced instructor, the right sort of aerobatic aircraft and at a height of at least 5,000ft. Higher preferably. Oh, and wearing helmets and a parachute. For a maximum of 20 minutes... after that my stomach has had enough.

Most GA pilots just want to fly from A to B, or have a general bimble around, without the drama, much like airline and most commercial pilots. Just the same, it's good to be prepared and have an idea what to do should That Worst Day ever come around.

It's with that in mind that Ultimate High Academy has developed a UPRT course for General Aviation. Ultimate High is well known for its max adrenaline tailchasing sorties and aerobatic routines including the 'Utter Nutter',

What happened on flight AF447?

Air France flight AF447 went down in the Atlantic in June 2009 while on a flight from Rio de Janiero, Brazil to Paris, France killing all 228 on board.

The aircraft, an Airbus A330, stalled after the aircraft flew through turbulence and the pitot tubes become blocked with ice crystals, creating false airspeed data and causing the autopilot to disconnect.

There were three pilots on board. Captain March Dubois had 10,988 flying hours of which 6,258 were as captain. There were two first officers, David Robert, also experienced with 6,547 hours, and Pierre-Cedric Bonin, with 2,936 hours.

Captain Dubois took the second break, leaving the two FOs to fly the A330. Bonin was Pilot Flying. After entering turbulence and the autopilot disconnecting, he took control using the sidestick and correctly reduced speed to the recommended Mach 0.8.

While correcting a roll, Bonin pulled back on the sidestick sharply, exceeding the Angle of Attack tolerance and the stallwarner sounded. The recorded airspeed dropped from 274kt to 52kt as the aircraft climbed rapidly. As it reached the max altitude of 38,000ft, with throttles at full power, it stalled.

First officer Robert took control and lowered the nose but Bonin was still pulling back on his. The inputs cancelled each other. Captain Dubois was back in the cabin at this point. The Angle of Attack didn't drop below 35 degrees until impact into the ocean.

The final report by the French accident investigators (BEA) identified the crew's incorrect actions as one of the causes of the crash. "The crew's failure to diagnose the stall situation and consequently a lack of inputs that would have made it possible to recover from it," said the report.

One of the BEA's recommendations was that, "EASA review the content of check and training programmes and make mandatory, in particular, the setting up of specific and regular exercises dedicated to manual aircraft handling of approach to stall and stall recovery, including at high altitude."

01 Upset Recovery Training with Ultimate High is in a Slingsby Firefly and starts with simple recovery from a nose low attitude with a slice of steep bank thrown in, induced by instructor Mark, in the left seat

02 "And recover." Mark hands control to me. I remember 'Push-Roll-Thrust', but forget to say it out loud, as briefed. The wings weren't quite level when I started to bring the nose up. Remember to close the throttle

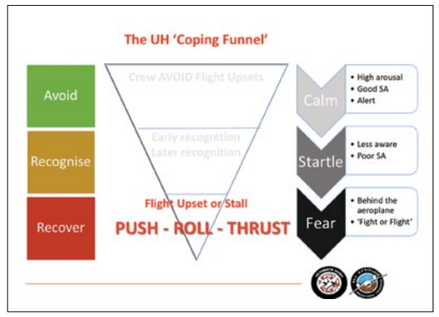
03 Next, Mark takes control again, checks all around for traffic, makes sure we're over the sea but close to the Sussex coastline, and puts the Firefly into a nose high, speed decreasing attitude... "and recover"

04 Staring at blue sky, it's Push the stick forward, Roll the wings level, add power for Thrust. I'm a bit quick pulling the aircraft back to straight and level, possibly risking a second stall. This is building block stuff

05 So now Mark is putting the aircraft into a stall with the throttle closed. Speed is decreasing (see the ASI), we're climbing slowly and there's a bit of buffet. The wing drops... "and recover." He's good at saying that

06 Getting the aircraft flying again is critical so reduce the Angle of Attack and unload the wing. Push the stick centrally forward and centre rudder pedals. As the airspeed rises, roll the wing level and adjust Thrust

Above Mark has a concise Powerpoint presentation to help get over key points of the briefing **Right** The longer into the upset you go, the greater the anxiety **Below** Author, left, with Ultimate High instructor Mark Greenfield



mostly aimed at non-pilots looking for an extraordinary thrill. But it also has a serious side and has played a major role in developing the latest regs for teaching UPRT to airline pilots (see sidebar).

The work that's gone into those regs has filtered down to Ultimate High's course for GA – and decisively changed the emphasis. Gone are the extreme manouevres threatening the stability of your breakfast. Nowadays, it's about recognising the early signs that you're about to depart from controlled flight and avoiding it.

Is it really worth the effort, I can hear you asking? Isn't it just another way of parting me from my money?

Ultimate High's head of safety, Chris Kingswood, former chief training captain for easyJet no less, says, "On-aircraft UPRT helps pilots to avoid, recognise and recover from these flight upsets, and exposes pilots to the physiological and psychological elements that flight simulators cannot provide."

Now that sounds a bit right-on, but I should add that flying with the Ultimate High team is a whole lot of fun as well as serving a serious purpose.

And they're based at Goodwood Aerodrome, which has something interesting going on in every corner

Ultimate High

As the longest established UPRT Approved Training Organisation in the UK, Ultimate High Academy has been heavily involved with the development of on-aircraft and flight simulator flight safety programmes.

With accidents arising from Loss of Control in Flight (LOC-I) being the largest cause of commercial (and GA) aviation fatalities, the company recognised early the requirement for this specialised training. Ultimate High were the UK representative on the EASA Rule Making Group (RMG.0581) that put together the new 'Advanced UPRT' requirements that become mandatory for new commercial pilots from December this year.

Ultimate High delivers standardised, turnkey and bespoke academic, on-aircraft and Flight Sim UPRT programmes across the full range of aviation sectors. The company has worked with a variety of airlines, ATOs and commercial and business operators to enhance crews' ability to avoid, recognise and recover from flight upsets resulting from LOC-I.

As well as delivering on-aircraft UPRT, Ultimate High Academy also provides Train the Trainer programmes for flight instructors (FIs) and simulator training instructors and examiners (TRI/TREs). We also provide UPRT consultancy services and have put together three year (six session) recurrent flight sim programmes for airlines.

The CAA has made us the first UK ATO cleared to deliver UPRT to cover the new FCL.745.A requirement. *Mark Greenfield*

07 We carry out the same stall exercise but this time with some angle of bank, just to add another layer. It's the same recovery technique though. Push the stick centrally forward, Roll wings level, adjust Thrust

08 Moving on, this time it's a spiral dive which can be disorientating. Nose down, wings banked, speed increasing, vertical speed indicator (VSI) going off the clock... it's that blinking phrase again, "and recover"

09 A spiral dive is a touch scary so the simple mantra "Push-Roll-Thrust" is the only thing going through my rapidly getting maxed out brain. Reducing power quickly is vital as is gently pulling back on the stick, not rushing it

10 Up 'til now, it's been straightforward but Mark's about to put the Firefly into a sideslip as though on final approach, slow speed, high Angle of Attack so the Firefly stalls. He talks me through it before doing it...

11 ...which was just as well because the resulting wing drop and then sudden flick in the opposite direction was 'quite dynamic'. First time, I pulled back on the stick before rolling level... dangerous. Better second time

12 Time for a simple 'sensing the aircraft departing from controlled flight' exercise pretending the pilot flying (Mark) hasn't noticed the nose is high and speed decreasing – it's my job to intervene before it gets out of hand

13 Back to the harder stuff, this time an accelerated stall which ends with a violent flick into an incipient spin... "and recover." It's the same technique – Push-Roll-Thrust – and it's starting to become second nature now

14 The final exercise was a new one for me. Imagine you're turning onto final approach and to tighten the turn, you squeeze in some rudder. You're slow, carrying some flap... the result is shockingly violent

15 ... yes, this is where we ended up. 90 degrees to the ground, speed low, VSI increasing (at first)... "and recover." Thanks Mark! First time, the recovery worked but I was very untidy and close to a secondary stall

16 Second time, much better, remembered to call out what I was doing and got an OK from Mark. The good thing about this exercise is that once done, you will never, ever, over-use the rudder on the turn to final again

"Mark believes UPRT should be considered as an integrated component of pilot training, not as a standalone 'bolt-on'"

including Ultimate High's airside building and fleet of training and aerobatic aircraft.

You'll notice that Ultimate High's training aircraft for UPRT is the Slingsby T67 with side-by-side seating – much better for training than the tandem seating in an Extra. Neither are helmets worn or parachutes carried, nor military-style flying suits. This is all about normal, everyday flying.

Mark starts with a ground briefing based on a Powerpoint presentation. As he says, "First and foremost this is a confidence builder. We want you to understand the mantra of Avoid - Recognise - Recover. To do that we're going to expose you to a variety of attitudes and deviations from 1+g.

"We'll implement and practise a simplified stall and upset recovery technique and develop resilience to startle and surprise. We'll build layers of protection against flight upsets and develop confidence and trust having successfully recovered from a variety of stalls and upsets in a 'real' environment."

Above Ultimate High's Slingsby Firefly is a great aircraft for UPRT training
Left Training area is a few minutes flight south of Goodwood over the south coast
Below Yes, that's a grin, a faint grin, but one nonetheless

The full course is about three hours of groundschool going through the various reasons for an upset, plus a thorough briefing before going out for two flights. Two flights because most pilots will be mentally maxed out during the first flight and there comes a point when a rest on the ground is beneficial.

The groundschool is comprehensive, covers much more than the PPL and has elements of what can be learned from the airline pilot cockpit such as Pilot Monitoring and Crew Resource Management. So, if you're a pilot but on this flight a passenger in the front seat, you should be monitoring what the pilot is doing, how the aircraft is responding and noticing things that the Pilot Flying might just be too busy to take in. It's a bit like being an extra pair of eyes looking out, which we all do, but also looking in, particularly at times of high workload.

Understanding Angle of Attack

Mark believes UPRT should be considered as an integrated component of pilot training, not as a standalone 'bolt-on'. A considerable amount of time is spent on how to avoid flight upsets, broken down into three causes: environmentally induced such as turbulence, systems anomalies such as sensor data, and flight control such as pilot-induced upsets.

Crucial to everything is understanding Angle of Attack, not just in a climb but in all attitudes of flight, and a considerable part of the groundschool is spent on this. It's what lies behind the AF447 accident (see box p26) and many others.

There are plenty of studies out there which break down the different types of upset and give detailed responses to each. Mark thinks the chances of a pilot being able to recall all that detail in a moment of crisis are minimal, so he has boiled it down to a simple process:

- Upset? Recognise the upset
- Push all controls centrally forward
- Roll so wings are level with the horizon
- Thrust – adjust throttles (and drag) as required.

That's U-P-R-T for short. Should be easy enough to remember, right? Ok, let's find out, let's go flying...

As you can see from the sequence of photos, we blitzed a series of flying exercises, starting with the relative basics of recognising and recovering from a stall situation. This was followed by a spiral dive. When would you ever fly a spiral dive? Well, you probably wouldn't deliberately but remember John F Kennedy Jr's accident 20 years ago. He was descending in his Piper Saratoga over water at night, not holding an instrument rating, and became disorientated and lost control. We'll never know, but if he'd recognised the spiral dive, maybe he'd have been able to get back to straight and level.

Each exercise was done twice, 'building blocks' as Mark calls them, before moving onto more serious scenarios. Stalling the aircraft when in a sideslip, for instance. First one wing is low in the sideslip then at the stall the whole aircraft flicks violently the other way. An accelerated stall, also violent, then the showstopper, using excess rudder on a turn to final approach as though trying to tighten the turn and line up with the centreline. Once experienced, you'll never, ever, do this. Chalk one up for UPRT. Every pilot should do this course.