The Oldest Accident

It's the oldest accident in aviation. In the pioneering days they used to call it a Chute Mortelle – then it was little understood. Commonly known today as a stall/spin accident, despite now being fully understood it relentlessly continues to kill and maim pilots and passengers on a regular basis.

Yet of all the accidents in aviation waiting around the corner, it's the most avoidable. It should never, ever, happen as the rules of avoidance are so simple and fundamental to aeroplane handling.

The laws of physics are part of our daily lives. They are absolute and unbendable – including those that govern why your aeroplane flies and at what point it quits flying. No different really from persisting in walking south from Beachy Head – it's inevitable that your walk will be terminated with a Chute Mortelle!

Just as our non-suicidal walker will naturally stop short of proceeding over the cliff edge, no pilot need ever accidentally stall and spin into the ground. So just why does it happen and, more importantly, how can we avoid it?

Stall/spin accidents can usually be analysed into one of two categories. First we have those accidents that come about as the consequence of ill-advised exuberant flying – when confidence and adrenalin exceed wisdom and ability. (This was the principal subject of my article in the August/September '95 edition of PF)

Second, there is a common thread through just about all other stall/spin accidents. The train of events usually begins when some occurrence critically increases the pilot's workload. This would apply especially in a forced landing situation – although it should be appreciated that the potential for a high workload stall/spin accident is always present whenever aptitude is compromised by lack of practise, training or application. Add to that distractions caused by weather, other traffic or third parties and the scene is set.

The onset of a low level stall/spin accident can therefore be approached from a number of different directions but in all cases the tragic finale is the same. For those of us who have been unfortunate enough to witness one, the memory will forever recall how desperately quick the transition from flight was to the sickening sight of broken bodies and aeroplane wreckage. Those that die in the accident aren't the only victims.

Precisely what went wrong can readily be explained in terms of that branch of physics pilots know as Principles of Flight – regrettably, for all too many pilots, those exacting rules have become shrouded in myth and folklore.

At the same time, many pilots haven't practised even simple stalls at a safe height, let alone the more exotic variations, since the ink was wet on their license. Many are therefore ill prepared to cope when the workload gets high, for whatever reason, and reflex recovery action cannot be depended on to save the day. That's still no reason to die – read on.

When I asked a selection of pilots, in preparation for this article, how they avoided accidentally stalling, their most frequent answer was 'keep the speed up'. There's some

truth in this of course but it's not the whole story by a long way. Certainly close attention to speed is an essential safety consideration but excessive speed in itself can severely compromise the ability to manoeuvre accurately, especially when close to the ground. In addition, given that it's possible to stall an aeroplane at any speed within its performance envelope, we must look a little further for the real answer. But before leaving the subject of speed, it should be noted that the aeroplane's principle control of airspeed is the elevator.

To really understand the stall it will be necessary to delve just a little into applied theory of flight – nothing too demanding, just enough to get over one very important point which is fundamental to stall prevention.

There is one and only one reason why an aeroplane stalls. A stall can only occur when the wing reaches its 'critical angle of attack' - that is, when the angle that the wing presents to the oncoming airflow becomes too great for the air to smoothly flow over it. At that point the aeroplane loses a substantial part of the 'lift' which has been supporting its weight – the nose will drop and there will be an immediate height loss. The aeroplane doesn't want to kill you, just left alone (controls neutral) it would fly again. However, in a typical stall accident, as the nose drops the pilot will instinctively pull the stick all the way back and hold it there – all the way to the ground and disaster.

In this scenario just one control on the aeroplane played a starring role – the elevator! It would logically follow that the whole train of events came about due to the misuse of the elevator control.

Let's delve a little further. So far we have established that the direction of the oncoming airflow has some important significance. Many pilots I have spoken to imagine it as something that always flows in a horizontal plane. This would only be the case of course when the aeroplane is flying at a constant altitude – in reality the oncoming airflow is being approached from the direction the bulk of the aeroplane is heading. This is not saying the same thing as the direction in which the nose of the aeroplane is pointing. The angular difference between the two is at its greatest when the aeroplane stalls. To unstall the aeroplane the nose has to be quickly moved closer to the oncoming air, whatever its direction. It is difficult to visualise – you can't see it but the position of your elevator – as seen by you at the control stick - will tell you.

Understand the elevator control and you will open a whole new world of utter confidence that you will never, ever, accidentally stall your aeroplane.

It doesn't matter whether you are climbing, descending, or turning, the position of the control stick will always guide you reliably that your angle of attack is less than critical.

Think of it this way – the elevator is the control which elevates the angle that the wing makes with the oncoming airflow. It follows therefore that if you don't move the stick back beyond a certain point you will never stall the aeroplane from any normal mode of flight. Yes, it is a fact – any given aeroplane has an extremely close relationship between elevator/stick position and the critical angle of attack.

Establish where that position is in your aeroplane – try it in different configurations, for example, with flap for any variation. There may be a small but insignificant variation at extremes of C of G position. When you are confident, check forward just a little as a safety

margin and to allow full aileron operation – then if you never in normal flight move the stick aft of that point, I promise that you will be unable to stall the aeroplane. If the aeroplane doesn't stall it will not spin either. You may reasonably ask why aeroplanes aren't designed so that the elevator movement is restricted, as an aid to stall prevention – well that isn't possible as the extra movement is essential for the roundout when landing.

In an ideal world all pilots would regularly practise aircraft handling generally, and stalls from all attitudes in particular. However, to be realistic, many pilots feel insecure even in practice stalls from straight and level flight. In a real accidental stall such a pilot is unlikely to be able to readily call on the correct reflex recovery action to get out of trouble – just the reverse in fact.

It was with those pilots in mind that this article was principally written, as they are without doubt at the greatest risk when it all goes pear-shaped.

My advice to those pilots is this – and you won't even have to stall the aeroplane to do it - fly your aeroplane as slowly in level power off flight as you feel comfortable with – note the stick position. Then move the stick a little further forward until the aeroplane's best glide speed is achieved – again note the position. Practise repeatedly moving the stick to this position until it becomes instinctive. By training your reflex action in this way - in an emergency you are then unlikely to become a stall/spin statistic.

When I was taught to fly, the text book advised that on encountering a stall, one should instantly open the throttle, move the stick forward as little as possible so as not to lose height, and pick up the dropped wing with rudder. That may be OK for a handling practise exercise - in an emergency; however, I believe we are seriously deluding ourselves to expect that a pilot in workload overdrive will do that.

A much more likely outcome – borne out by the number of stall/spin accidents, is that when the nose suddenly goes down the stick will be pulled back and stay there all the way to the ground.

Anyone who is practised in stalling and flying in unusual attitudes will develop a reflex action to unload the aeroplane at the first sign of a stall – that is, to move the stick forward into the middle. Immediately the angle of attack will be reduced below the critical, the aeroplane will fly again and the use of power and ailerons will be as normal – what more could you want!

Finally, let's look at a practical example. Every year there are a significant number of stall/spin accidents following engine failure. When the donk suddenly quits for real it's quite normal for the brain to go into neutral as it comes to terms with the situation. At this point there's a tendency to forget to fly the aeroplane and for the stick to creep backwards to keep the nose on the horizon as the aeroplane slows down. Even worse if it happens after takeoff when the speed can reduce dramatically quickly.

Rule one when the engine fails is to quickly get the brain into gear – stick forward and establish the best glide speed.

So far so good – the first critical stage is safely passed. But the workload will remain very high – manoeuvring and searching for a suitable site for a forced landing whilst turning and

descending with the minimum height loss, it's all too easy for that stick to creep backwards again.

Having survived so far we now reach what is potentially the most hazardous hurdle to cross – the last couple of hundred feet or so. There may be ground obstructions – the fence you didn't see. The arrival at the site hastily selected for landing may have been misjudged. The fixation to will the aeroplane to fly a little further, or turn a little tighter, will be overwhelming. But aeroplanes don't fly on will – they blindly obey the laws of physics.

All attempts to stretch the glide (stick further back!) will inevitably end in a spectacular Chute Mortelle. The only chances of survival are to make sure that the stick stays forward of the critical point and make the best of the roundout into whatever terrain awaits you.

You may damage the aeroplane but the chances are that you will walk away from it – nobody ever walks away from a stall/spin accident.

Have fun and fly safely.

Barry Smith